YUKON RIVER TECHNICAL REPORT:

1987

prepared by

The Joint Canada/United States
Yukon River Technical Committee

October 6-8, 1987

TABLE OF CONTENTS

Page

1.0 Introduction

David Colson and John Davis, the respective heads of the U.S. and Canadian delegations to the Yukon River Neogtiations, directed members of the Joint Canada/U.S. Yukon River Technical Committee to address the following issues prior to November of 1987:

1. Develop an interim escapement objective for Fishing Branch River fall chum salmon.

2. Review interim escapement objectives for Alaskan chinook and fall chum salmon stocks in the Yukon River.

3. Examine opportunities for developing stock specific harvest strategies in the Yukon River fisheries.

4. Review the results of stock identification studies including electrophoretic, parasitic and scale patterns analysis studies in the Yukon River.

5. Examine ways to improve reliability of run assessment techniques including aerial survey, foot survey, hydroacoustical and weir counts, in addition to test fishing, juvenile and adult salmon mark-recovery studies.

6. Review chinook salmon stock rebuilding strategies in the Yukon River.

The results of discussion of a majority of the above items are contained in this technical report. In addition to the agenda items described above the Technical Committee also reviewed catch and escapement statistics for 1987, management of the fisheries in 1987, high seas interceptions of Yukon River salmon, status of the stocks, numerous salmon related projects in the Yukon River in 1987, the status of the Clesr and Whitehorse hatcheries, the run outlook for 1988, and data requests

The Joint Canada/U.S. Yukon River Technical Committee met at the Institute of Ocean Sciences, Patricia Bay, Vancouver Island from Oct. 6 to Oct. 8, 1987 (Table 1).

The Technical Report contains the most current estimates for catch and escapement of salmon in the Yukon River. The reader should be aware however, that at this time all 1987 chinook and summer chum salmon statistics are preliminary in nature and those for fall chum and coho salmon are incomplete. Fall chum salmon fisheries generally continue through early October and escapement surveys are generally not completed before early Novermber. Final 1987 catch and eacapement statistics for all species of Yukon River salmon will be available by March, 1988.

Table 1. Members of the Joint Canada/US Yukon River Technical Committee.

Alaska Department of Fish & Game

Ron Regnart (co-chair)
Linda Brannian
Larry Buklis
Craig Whitmore
Fred Andersen (absent)

United States Fish Wildlife Service

Dick Marshall
Rod Simmons

National Marine Fisheries Service (U.S.)

Aven Andersen

Department of Fisheries & Oceans (Canada)

Mike Henderson (co-chair)
Sandy Johnston
George Cronkite
Robin Harrison (absent)
Gordon Zealand
Terry Beacham

Yukon Territorial Government

Mark Hoffman

2.0 1987 Commercial Fishery - Alaska

In 1987 a total of 574,209 salmon was commercially harvested from the Yukon River in Alaska. The catch was composed of 131,971 chinook, and 442,238 summer chum salmon (Table 2). Additionally, 122,259 lbs. summer chum salmon roe was harvested. No commercial fishery was allowed for fall chum or coho salmon during 1987. The chinook salmon catch was 3% above the recent five year average (1982-1986) while the summer chum salmon catch was 27% below the recent five year average. The ex-vessel value of the fishery was $7.2 million (Table 3).

2.1 Chinook Salmon

Sustained yield fishery management for chinook salmon is achieved through the use of emergency order authority to establish fishing seasons, fishing periods, and gillnet mesh size restrictions. The commercial season is opened in the lower river when increasing subsistence and/or test net catches have occurred over a 7 to 10 day period. The escapement of this segment of the run past the lower river commercial fishery is thought to provide for increased escapement of chinook salmon bound for upper river spawning areas in Alaska and Canada which are subject to intensive fishing effort along the entire length of the river. A more conservative management strategy was adopted for the 1986 season and continued for the 1987 season. This conservative management plan was developed in response to new information obtained from the analysis of 1982-1985 U.S./Canada catch allocations based on SPA, and escapement estimates which indicated that some chinook salmon stocks have repeatedly undergone high exploitation rates resulting in less than optimum spawning escapements. The harvest was to be maintained within the guideline harvest range (65,550-126,950 chinook all districts combined), with the catch proportional to run strength.

The lower Yukon River was generally free of ice by May 30. Chinook salmon migratory timing into the lower river appeared to be average. The lower river commercial fishery was opened by emergency order after approximately nine days of increasing subsistence and test net catches in the lower river. The fishing season was opened on a staggered basis in lower river districts: June 15 in District 1, June 17 in District 2, and June 21 in District 3 (1,800-2,200 chinook salmon guideline harvest range). A fishing schedule of two 24-hour periods per week was established with provisions incorporated to reduce fishing time if the catch exceeded a level beyond which run strength could support.

The first three periods in Districts 1 and 2 were allowed to occur as initially scheduled, after which the combined harvest for the two districts was approximately 83,000 chinook salmon. At that time it was determined that the chinook salmon return was above average in magnitude based on cumulative test net indices and hydroacoustic enumeration. Although the midpoint of the guideline harvest range had not been reached, it was warranted to reduce the next fishing periods in Districts 1 and 2 from 24

Table 2. Alaskan commercial catch of Yukon River salmon in 1987.

District Subdist.	No. of Fishermen	Summer Chum: Chinook	Summer Chum: Chum	Summer Chum: Roe (lbs)	Summer Chum: Equivalent Chum (a)	Fall Chum: Chum	Fall Chum: Roe (lbs)	Fall Chum: Equivalent Chum (a)	Total Salmon: Coho	Total Salmon: Salmon	Total Salmon: Roe (lbs.)
1	440	76,643	222,898	0	222,898	0	0	0	0	299,541	0
2	239	47,458	174,876	0	174,876	0	0	0	0	222,334	0
Subtotal	656	124,101	397,774	0	397,774	0	0	0	0	521,875	0
3	13	2,039	3,501	0	3,501	0	0	0	0	5,540	0
Total Lower Yukon	659	126,140	401,275	0	401,275	0	0	0	0	527,415	0
4 A	67	97	29,314	110,977	140,291	0	0	0	0	29,405	110,977
4 B,C	29	1,433	677	10,497	11,174	0	0	0	0	2,110	10,497
5 A,B,C	27	2,539	362	44	406	0	0	0	0	2,901	44
5 D	3	566	0	0	0	0	0	0	0	566	0
6	25	1,202	10,610	741	11,351	0	0	0	0	11,812	741
Total Upper Yukon	141	5,831	40,963	122,259	163,222	0	0	0	0	46,794	122,259
Total Yukon Area	800	131,971	442,238	122,259	564,497	0	0	0	0	574,209	122,259
5 Year Average 1982-1986		127,523	606,669	198,072	804,741	228,441	2,260	230,700	47,473	1,010,106	200,332

(a) "Equivalent chum" includes numbers of fish converted from roe sales (one pound of chum salmon roe equals one chum salmon.

Table 3. Value to commercial fishermen of Yukon River salmon in 1987. (a)

	U.S.					Canada	
	Lower Yukon Districts 1-3		Upper Yukon Districts 4-6				
	$/lb	Value (1,000$)	$/lb	Value (1,000$)	Total Value (1,000$)	$/lb	Value (1,000S)
Chinook	1.98	5,429	0.79	92	5,521	(b)	(b)
Summer Chum	0.48	1,314	0.19	53	1,367	-	-
Fall Chum	-	-	-	-	-	(b)	(b)
Chum Roe	-	-	2.22	271	271	-	-
Coho	-	-	-	-	-		
Total		6,743		416	7,159		

(a) U.S. fishery value in U.S. dollars. Canadian fishery value in Canadian dollars. Current exchange rate is approximately 1.35 Canadian dollars per 1.0 U.S. dollar.

(b) Not available.

hours in duration to 12 hours. This action was taken in consideration of the guideline harvest range, harvest to date, the harvest from scheduled fishing periods, and the anticipated incidental harvest of chinook salmon during subsequent restricted-mesh-size fishing periods. Following the fourth unrestricted mesh size fishing period in Districts 1 and 2, the combined harvest was 102,274 chinook salmon. Restrictions were then implemented to allow for the use of gillnets of six-inch-maximum mesh size to direct harvest toward summer chum salmon. Three additional commercial fishing periods of 6 hour to 24 hour duration were allowed in both Districts 1 and 2 between 29 June and 10 July. An additional 21,827 chinook salmon were harvested during these restricted-mesh-size periods, which was twice the prior five-year average (1982-1986) for the same time period. The total District 1 and 2 catch was 124,101 fish, 3% above the upper end of the guideline harvest range and 4% above the recent five-year average (1982-1986). Comparative test-net-catch data indicted that the 1987 chinook salmon return was most similar to the 1981 return from which 145,278 fish were harvested. During 1981, good spawning escapements were documented throughout the Yukon River drainage.

In Disrict 3 a total of three unrestricted mesh size fishing periods (two 24 hour, one 12 hour) and one restricted-mesh-size fishing period (24 hour) was allowed 21 June - 2 July. The initial delay in opening District 3 allowed the first segment of the chinook salmon return to pass through the district prior to commercial fishing. A total of 2,039 chinook salmon was harvested from District 3, which was approximately the midpoint of the guideline harvest range, and 23% below the recent five year average (1982-1986).

In Districts 4, 5, and 6 (upper Yukon area), the commercial fishing season opened as established by regulation. Fishery closures were established by emergency order authority except within one subdistrict (4A) of District 4 which closed by regulation on August 1. Emergency order closures became effective on August 1 in the remainder of District 4 (subdistricts 4B and 4C), July 11 in a portion of District 5 (subdistricts 5A, 5B, and 5C), July 20 in the remainder of District 5 (subdistrict 5D), and August 14 in District 6. In District 6, commercial (July 21-August 12) and subsistence (July 31-August 7) fishing closures were implemented in response to harvest levels and spawning escapement requirements. The subsistence closure affected that portion of the district from the mouth of the Chena River to the mouth of the Salcha River.

The total upper Yukon area commercial chinook salmon harvest was 5,831 fish, 16% below the upper end of the combined districts guideline harvest range (5,550-6,950) and 6% above the recent five year average (1982-1986). The harvest of chinook salmon in Districts 4 and 5 was 4,629 fish, 25% below the upper end of the combined districts guideline harvest range (4,950-6,150) and 4% above the recent five-year average (1982-1986).

2.2 Summer Chum Salmon

Summer chum salmon run strength was below average, with average migratory run timing. Summer chum salmon directed fishing periods were implemented in the lower Yukon area after termination of the chinook salmon directed fishery. Three restricted-mesh-size fishing periods (six-inch-maximum mesh size) were allowed in Districts 1 and 2 and a single period was allowed in District 3 between June 29 and July 10. Fishing period duration and frequency were significantly reduced from prior years due to below average summer chum salmon run strength. This was the first time in the history of the summer chum salmon fishery that the regular fishing schedule was reduced in-season for conservation purposes. Also, the July 10 season closure was the earliest closure in the history of this fishery. The lower Yukon area summer chum salmon harvest was 401,275 fish, 28% below the recent five year average (1982-1986), and the lowest since 1977.

The upper Yukon area summer chum salmon harvest was 40,963 fish and 122, 259 lbs of roe, 16% and 38% below the recent five-year averages (1982-1986), respectively. In response to below average summer chum salmon run strength, commercial fishing restrictions were implemented in Districts 4 and 6. Fishing time in District 4 was reduced from two 48-hour periods per week to a single 48-hour period per week beginning July 7 and continued through the end of the season. Additionally, on achievement of the District 6 chinook salmon commercial harvest, the district was closed with the closure extended in duration from recent years to afford additional protection to summer chum salmon.

2.3 Fall Chum Salmon

In anticipation of a poor return of fall chum salmon, regulation changes implemented for the 1986 season were again adopted for the 1987 season. This action provided for a conservative management plan consisting of decreased harvest guidelines, shorter fishing periods and a season closure. The commercial fishing season closed July 10 in the lower Yukon area due to conservation measures taken during the summer chum salmon directed fishery. A continuation of the mid-season closure was necessary to afford increased protection to the early run segment of fall chum salmon and to assess fall chum salmon run strength. Lower Yukon test net catch indices, hydroacoustic counts and subsistence fishery catch information indicated fall chum salmon run strength would provide for achievement of spawning escapement objectives, and subsistence harvest levels similar to recent years. However, to achieve these allocation priorities, it was not possible to provide for a commercial fishery.

The early portion of the fall chum salmon migration was weak with the first major pulse of salmon entering the river from July 30 to August 1. The entry of fall chum salmon into the lower river remained farly stable at low to moderate levels after this time through the end of August.

2.4 Coho Salmon

Test fishing in the lower Yukon area and hydroacoustic enumeration indicated the coho salmon run was average to slightly below average in strength. Coho salmon, which exhibit later run timing, are generally taken incidental to the more abundant fall chum salmon. No commercial fishing was allowed for coho salmon since fall chum salmon run strength was determined to be at a level which would not allow for an incidental harvest of fall chum.

3.0 1986 Commercial Fishery - Canada

As of October 1, 1987, the Canadian Yukon River commercial fishery had harvested 41,314 salmon consisting of 10,701 chinook salmon and 30,613 fall chum salmon (Table 4). Since the chum salmon fishery is still in progress, final catch figures are not yet available. The preliminary harvest data suggests an average chinook salmon catch and an above average chum salmon catch, showing a slight increase at the end of September.

3.1 Chinook Salmon

The pre-season expectation was for an average-to-above-average return of chinook salmon based on above average brood year escapements. The 1987 management plan for the Canadian Yukon River commercial fishery followed the 1986 plan to conserve early run, upper Pelly River spawning stocks which have been depressed in recent years. Tagging information, though limited, has indicated that the stocks of concern have been present in the Canadian commercial fishery in early July. Accordingly, the normal fishing time to July 18th was reduced from five to two days per week. This action

Table 4. Commercial catch of chinook and fall chum salmon through October 1st, 1987 from the Canadian portion of the Yukon River.

Week Ending	Chinook		Fall Chum	Average Number of Fisherman
July 12	14			6
July 19	343			15
July 26	2,456		11	22
August 2	3,622		10	23
August 9	4,183		31	23
August 16		CLOSED		
August 23		CLOSED		
August 30	53		193	11
September 6	18		684	12
September 13	9		8,148	16
September 20	2		8,391	12
September 27	1		7,220	15
October 4			5,925	13
Total	10,701		30,613	

resulted in only limited effort during the first two-day opening. Fishing effort increased moderately during the second opening. After July 18th, the commercial fishery downstream of the Sixty Mile River was open five days per week; the area upstream of the Sixty Mile was open six days a week until August 6th when the fishery was closed until August 23rd for chinook conservation.

The preliminary total Canadian harvest was 10,701 chinook salmon which is similar in magnitude to the recent 5-year average (1982-86) of 10,868. Peak catches were recorded the last week of July and first week of August indicating run timing was perhaps a little later than average. A total of 36 commercial licenses were issued in 1987, although the maximum number fishing in any given week was 23, which was almost identical to 1986.

Below average counts of chinook salmon at the Whitehorse fishery and Big Salmon weir, an inadequate Indian Food Fish catch, and low catches in DFO fishwheels prompted an early closure to the chinook season on August 6. The resulting two-week closure in August resulted in a 40% decrease in fishing time compared to a normal chinook season. At least 3,000 chinook were estimated to have escaped the commecial fishery as a result of the closure. Preliminary analysis of the 1987 DFO chinook salmon tagging study indicated a Canadian commercial harvest rate of approximately 27.5% compared to 28.9% in 1986.

3.2 Fall Chum Salmon

The 1987 fall chum fishery opened on August 23 with an objective of reduced effort in view of concerns for fall chum stocks. The fishery opened for 4 days below the Sixty Mile River and five days above the Sixty Mile River. The majority of fishing effort above the Sixty Mile River traditionally consists of domestic fishermen.

The run is currently in progress with catches having peaked around the middle of September. The catch as of October 1st was 30,613 chum salmon. The run appears to be quite protracted with the DFO fishwheel showing a slight increase at the end of September.

4.0 1987 Subsistence, Domestic, Indian Food and Sport Fisheries

4.1 Alaska

Subsistence fishery surveys, described in Section 7.1.3, are currently in progress and harvest data are not yet available. Preliminary harvest data should be available by December 1987.

Sport fishery surveys described in Section 7.1.4 are currently in progress and harvest and effort data are not yet available.

In 1987, the subsistence fishery in a portion of District 6C of the Tanana River was closed from July 31 to August 7 to protect chinook salmon. The sport fishery in the Salcha River was also closed to the taking of salmon from July 29 to August 31. No other in-season restrictions or changes to published regulations were made in 1987.

4.2 Canada

The food fish monitoring program initiated in 1984 was continued in 1987. Although still in progress, preliminary catch data have been compiled for chinook salmon which indicates an estimated total catch of 6,100 chinook salmon. This represents about an average harvest (1982-1986 average was 6,856) but down considerably from the 1986 harvest of 8,925. Catch estimates for specific regions are as follows:

Carmacks	2,565
Pelly/Fort Selkirk	1,778
Teslin	675
Mayo	571
Dawson	?
Ross River	450
Old Crow	50
Total	6,089

Chum salmon catch data from the Indian Food fishery and the domestic fishery are incomplete at this time.

A total of nine domestic licences have been issued which allow non-native fishermen to catch salmon with gillnets or fishwheels for personal use. The preliminary estimated chinook salmon domestic catch is 330.

The sport fishery in the Yukon drainage system is estimated to have taken less than 200 chinook. Effort was concentrated mainly in the Klondike, Tatchun and Teslin River areas. Angling effort was down due to poor escapements and intense media coverage of the poor status of the chinook run.

5.0 Status of Stocks

Documentation of total Yukon River salmon escapement has not been possible in the past due to the vast size of the drainage, turbid water conditions, and funding limitations. Total population estimates for major portions of the drainage were attempted at two locations on the mainstem Yukon River in 1987: at river mile 122, near Pilot Station, using hydroacoustic counters; and just above the US/Canada border using tag and recapture techniques. This was the third consecutive year for the sonar enumeration program, and fifth out of the last six years for the tagging program.

Most available stock specific escapement information in 1987, as in previous years, was obtained by aerial surveys of selected index streams, although ground and boat surveys, weirs, counting towers, sonar countera, tag and recapture, and the Whitehorse Dam fishway have also provided escapement estimates. Comprehensive data are presently only available for chinook and summer chum salmon (Table 5 and 6). Fall chum and coho salmon escapement enumeration is still in progress at this time.

5.1 Chinook Salmon

Strength of chinook salmon spawning escapements in 1987 was variable between spawning areas in the lower, middle and upper portions of the Yukon River drainage. Spawning escapements were generally near or above objective levels in the lower Yukon River tributaries, and below objective in Tanana River tributaries and in Canadian spawning areas.

Spawning escapement survey counts of 3,281 chinook salmon for the West Fork Andreafsky River, 1,608 for the East Fork, and 1,179 for the Anvik River achieved the objectives for each of these spawning areas. The West Fork Andreafsky River count was the largest ever recorded, while a counting tower estimate of 2,011 chinook salmon was obtained for the East Fork. Counts of 1,128 chinook salmon for the North Fork and 493 for the South Fork of the Nulato River met the escapement objective of 500 fish for each fork. Historical survey data are sporadic for the Gisasa River, in the Koyukuk River drainage, but 731 chinook salmon were counted by aerial survey in 1987. Escapement objectives were not achieved in the Chena and Salcha Rivers, the major producers in the Tanana River drainage, which had peak survey counts of 1,312 and 1,898 chinook salmon, respectively.

In contrast to the Alaskan portion of the drainage but similar to 1986, chinook spawning escapments in Canadian Yukon tributaries were below desired levels. Upper Yukon and Teslin drainage escapements were of particular concern. A total of 327 chinook was enumerated at the Whitehorse fishway which compared poorly with both the 1986 count of 541 and recent five year average of 699 (1982-1986). Aerial surveys of the principle index area of the Nisutlin River (Teslin drainage) resulted in a peak count of 183 (ADF&G fixed wing) compared to the recent five-year average of 595 chinook salmon. The comparative 1986 count was 459 fish. DFO surveys of the same index area conducted by helicopter, three days

Table 5. Yukon River chinook and summer chum salmon escapement indices and population counts, with escapement objectives where established, 1987 (a).

Stream (Drainage)	Date	Survey Rating	Chinook Count	Chinook Objective	Summer Chum Count	Summer Chum Objective
Alaska Streams						
Archuelinguk River	7/21	Poor	7	-	149	-
Andreafsky River						
East Fork Counting Tower	6/25-7/25		2,011	-	45,221	-
East Fork Aerial Survey	7/27	Good	1,608	1,600	6,687	109,000
West Fork	7/26	Good	3,281	1,000	35,535	116,000
Atchuelinguk River	7/26	Good	674	-	11,973	-
Anvik River						
Sonar Count	6/21-7/26		-	-	455,876	487,000
Aerial Survey Total	7/23,30	Poor-Fair	1,179	-	157,709	-
Yellow River-McDonald Creek	7/30	Fair	879	500	-	-
Nulato River Mainstem	7/26	Good	17	-	2,505	-
North Fork	7/26	Good	1,128	500	4,658	53,000
South Fork	7/26	Good	493	500	4,094	-
Koyukuk River Drainage						
Gisasa River	7/27	Good	731	650	2,123	-
Dakli River	7/27	Fair	-	-	1,851	-
Wheeler Creek	7/27	Fair	1	-	1,641	-
Hogatza River						
Caribou Creek	7/27	Late	-	-	2,944	9,000
Clear Creek	7/27	Late	-	-	2,725	9,000
South Fork Koyukuk River	8/02	Fair-Poor	136	-	35	-
Jim River	8/02	Poor	100	-	2	-
Tanana River Drainage						
Chena River	8/04	Fair-Poor	1,312	1,700	333	-
Salcha Rilver	8/04,10	Fair,Good	1,898	3,500	3,657	3,500
Yukon Territory Streams						
Ross River	8/21	Poor	134	-	-	-
Lewis Lake Outlet	8/21	Poor	46	-	-	-
Hoole River	8/23	Fair	90	-	-	-
Little Salmon River	8/21	Good	456	-	-	-
Big Salmon River						
Aerial Survey Total	8/22,23	Fair-Good	1,121	-	-	-
Big Salmon Lake-Scurvy Creek	8/23	Good	379	-	-	-
Nisutlin River						
Aerial Survey Total	8/22,23	Fair-Good	275	-	-	-
Sidney-Hundred Mile Creek	8/23	Fair-Good	183	-	-	-
Wolf River						
Aerial Survey Total	8/24	Fair-Good	71	-	-	-
Wolf Lake-Red River	8/24	Fair-Good	35	-	-	-
Morley River	8/24	Poor-Fair	83	-	-	-
Swift River	8/24	Fair-Good	74	-	-	-
Jennings River	8/24	Poor	16	-	-	
Teslin R (above Teslin Lake)	8/24	Poor	19	-	-	-
Tincup Creek	8/25	Poor	63	-	-	

(a) ADF&G peak aerial survey counts of live fish and carcasses combined unless noted otherwise. Survey counts are only indices of abundance and are not total season escapement counts. Escapem objectives are based on aerial survey counts, except for the Anvik River sonar count objective. objectives are preliminary and subject to change as additional data becomes availble.

Table 6. Canadian Yukon River chinook salmon escapement index counts conducted by DFO, 1987(a).

Stream	Index Area	Date Day/Month	Live	Carcasses	Total	Conditions
Tatchun Cr.	Tatchun Lk.-Yukon R.	23/08	151	8	159	good(foot survey)
N.McQuesten R.	Sprague Cr.-S.McQuesten	18/08	0	2	2	good
Ross R.	Prevost Cany-Lewis Lk.	18/08	75	1	76	good
Tincup Cr.	Tincup Lk.-2/3 way to Kluane R.	20/08	96	4	100	excellent
Nisutlin R.	Sydney Cr.-100 Mile Cr.	20/08	23	4	27	excellent
		26/8	69	25	94	good-excellent
	McNeill R.-Nisutlin Lk.	26/8	24	3	27	good-excellent
Big Salmon R.	Quiet Lk.-weir	20/8	554	12	566	good
	weir-12 mi. below Souch Cr.	20/8	96	11	107	good
Little Salmon R.	Yukon R.-Bearfeed Cr.	25/8	411	57	468	excellent
Blind Cr.	1st bridge - mouth	19/8	0	1	1	poor (float trip)
Takhini R.	Kusawa Lk.-Mendenhall Cr.	28/8	200	2	202	fair
Klondike R.	N. Klondike Confl.-1/2 way between Rabbit & Rock Cr.	5/8	27	8	35	fair
	Flat Crk.-Henderson's Corner	17/8	0	10	10	fair
N. Klondike R.	dam-mouth	5/8	21	4	25	fair
	upstream of dam	5/8	14	0	14	fair
	dam-mouth	17/8	1	6	7	good
Wolf R.	Wolf Lk.-Fish Lk.	26/8	32	7	39	good

(a) All surveys conducted by helicopter unless otherwise noted.

prior to, and three days after the ADF&G survey, yielded total counts of 27 and 94 chinook respectively. Surveys of other Teslin tributaries (Morley, Wolf, and Swift Rivers) all indicated a poor escapement to this drainage. However, this trend was not consistently observed throughout other Canadian chinook salmon spawning streams. For example, aerial survey counts from the Big Salmon (673 DFO; 1,121 ADF&G) and Little Salmon (468 DFO; 456 ADF&G) were somewhat above average, and above the 1986 comparative data. In contrast, the 1987 Big Salmon weir count of 998 was approximately one half the 1986 count of 1,816. Approximately the same number of chinook were seen in Tatchun Creek in 1987 (159 DFO) compared to 1986 (155 DFO).

In terms of total Canadian chinook escapement (excluding the Porcupine), preliminary data analysis conducted of the 1987 DFO Yukon mark and recapture program indicates a border escapement of approximately 39,000 fish resulting in a spawning escapement of 21,500. This latter number is above recent estimates for 1985 (11,000) and 1986 (17,000) although it is about 40% below the midpoint of the interim spawning escapement objective (33,000-43,000).

5.2 Summer Chum Salmon

Summer chum salmon spawning escapements were below objective levels in 1987. The East Fork Andreafsky River tower count estimate of 45,221 summer chum salmon was 67% below the average of 135,400 fish since 1981. An aerial survey count of 35,535 summer chum salmon for the West Fork Andreafsky River was well below the objective of 116,000 fish. Sonar estimated escapement of 455,876 summer chum salmon in the Anvik River was 6% below the escapement objective of 487,000 fish, and 27% below the 1972-1986 average of 628,000 fish. The aerial survey count of 11,257 summer chum salmon for the Nulato River (both forks and mainstem combined) was well below the objective of 53,000 fish for the North Fork alone. Spawning escapement to the Salcha River was at the objective level based on an aerial survey count of 3,657 fish, but 34% below the 1982-1986 average.

5.3 Fall Chum Salmon

Test fishing indices and mainstem Yukon River sonar counts indicated that fall chum salmon run strength in 1987 was below average in magnitude, and not sufficient to support a commercial fishery. Very poor escapements during the period 1982-1984 have raised concerns over run strength, fishing exploitation rates and resulting escapements for the perod 1986-1988. As a result, an intensive effort is underway to restore fall chum salmon escapements to objective levels through conservative harvest regulations for the commecial fishery. Preliminary escapement data are only available from the Sheenjek and Chandalar River sonar projects, and from the Fishing Branch River weir project. A total of 130,000 fall chum salmon were counted in the Sheenjek River through September 25, 48,744 in the Chandalar River through September 25, and 41,381 in the Fishing Branch River through October 1. These counts are preliminary and incomplete at this time. However, it appears that fall chum salmon escapement to these spawning

areas is substantially improved from the very low levels observed in 1982-1984. Aerial and ground surveys of these and other spawning areas have yet to be conducted. Escapement data are not yet available for any of the Tanana River spawning areas.

In Canada, catches to date in the DFO test fishwheels have been approximately 70% of those recorded in 1986. Although no escapement surveys have yet been conducted, preliminary analysis of tag and recapture data (to October 1) for the commercial fishery indicates a border escapement of 94,000 (excludes Porcupine) and a net spawning escapement of 61,000 (assuming the subsistence catch ia similar to 1986). This current estimate of spawning escapement is slightly below the average from the 1982, 1983, 1985 and 1986 programs of 67,114 fish, but well below the interim escapment objective of 90,000-135,000 fish. However, run timing in 1987 appears to be somewhat more protracted than in recent years and as a result, it is anticipated that the final escapement estimate will surpass the recent average.

Spawning escapements to the Porcupine drainage appear to be better than in both 1986 and 1985. The Fishing Branch weir count to October 1 was 41,381 (prelim. data) compared to 29,982 in 1986, and 30,836 in 1985 to the same date.

5.4 Coho Salmon

Coho salmon escapement data for 1987 are not yet available. Test fishing indices and preliminary sonar counts in the lower river for the first portion of the run indicated that the 1987 coho salmon return was stronger than the 1986 return. However it does not appear to have been as strong as several of the preceding years. A more complete assessment of coho salmon run strength will not be possible until subsistence harvest and escapement dsta are available.

6.0 Marine Harvest of Yukon River Salmon

6.1 High Seas Salmon Gillnet Fisheries

In 1987 the Japanese mothership and land-based gillnet fisheries reported taking 39,000 and 77,000 chinook salmon, respectively, totaling 116,000 fish (Table 7). The mothership catch and combined fleet catch were the smallest reported during the past 26 years. Although similar to the 1986 catch, the 1987 land-based fleet catch was also small compared to previous years. The size of the mothership fleet decreased in 1987 compared to 1986, (4 to 3 motherships, 25-30% reduction in fishing vessels in both fleeta), but the small catch was mostly influenced by quotas in the Japanese-Soviet fishery agreement and an injunction to close fishing intitiated by a coalition of fishermen and environmentalists. Although quotas were unchanged from 1986, the Japanese terminated fishing early on July 10-12 (depending on the fleet) due to reaching their sockeye salmon quota within the U.S. FCZ. The Japanese - USSR fishery agreement requires

termination of the entire fishery when a species quota is achieved in any area. Also a coalition of western Alaska fishermen and environmental groups entered into a lawsuit against the U.S. Department of Commerce to prevent the issuance of marine mammal permits which would have allowed the Japanese to continue fishing in the U.S. FCZ. At issue was the number of incidentally captured Dall's Porpoise in the Japanese fisheries. Although the permit was issued to the Japanese, the coalition later successfully petitioned for an injunction that would have closed Japanese fishing in the U.S. FCZ on July 13. The Japanese apparently concentrated their effort on sockeye salmon in this area to fill their quota before the injunction was to take effect. These events which closed the Japanese fishery early probably resulted in the small 1987 catch of chinook salmon which are usually taken in greater numbers after July 10.

Estimates of the interception of western Alaskan chinook stocks (including Canadian Yukon) are shown in Table 7. Comparable estimates of the number of western Alaskan chinook salmon taken inside and outside the US FCZ by the mothership fishery during 1984-1987 are shown below:

Year	Inside USFCZ	Outside USFCZ	Total W. AK & Canadian Yukon
1984	12,599	23,685	32,284
1985	12,371	12,373	24,744
1986	10,000	14,000	24,000
1987	6,000	14,000	20,000

The results of a new study that estimated the numbers of Yukon River chinook salmon in the Japanese fisheries are discussed in Section 6.4 of this report.

Table 7. Total catch and estimated catch of Western Alaska (including Canadian Yukon) chinook salmon (in thousands of fish) in Japanese high seas salmon gillnet fisheries, 1964-1987 (1) (2)

	Mothership		Landbased		Combined	
Year	Total Catch	WA Catch	Total Catch	WA Catch	Total Catch	WA Catch
1964	410	179	208	40	618	219
1965	185	106	102	20	287	126
1966	208	108	118	22	326	130
1967	128	71	115	22	243	93
1968	362	244	97	18	459	262
1969	554	367	88	17	642	384
1970	437	312	148	28	585	340
1971	206	132	139	27	345	159
1972	261	189	107	20	368	209
1973	119	56	165	31	284	87
1974	361	208	188	36	549	244
1975	162	108	137	20	299	407
1976	285	117	201	42	486	159
1977	93	55	146	31	239	86
1978	105	36	210	63	315	99
1979	126	69	160	45	286	114
1980	704	416	160	22	864	438
1981	88	30	190	55	278	85
1982	107	45	165	41	272	86
1983	87	31	178	44	265	75
1984	82	36	92	21	174	57
1985	66	25	101	22	167	47
1986	60	24	77	20 3/	137	44 3/
1987 4/	39	20	77	5/	116	5/

(1) Sources:
1964-83: Rogers, Donald et al., 1984. Origins of chinook salmon in the area of Japanese Mothership Fisheries. Fisheries Research Institute, University of Washington. 215 pgs.
1984-1987 WA catch estimate for mothership fishery: Mike Dahlburg, National Marine Fisheries Service, Juneau, AK.

(2) Western Alaska catches represent fish from Bristol Bay, Kuskokwim, Yukon River and Norton Sound areas.

(3) From Rogers, Donald. April 1987. Interceptions of Yukon Salmon by High Seas Fisheries, Fishery Research Institute, University of Washington, 34 pp. Dahlburg, Michael T (NMFS) reported 9/27/86 an estimate of 24,000 Western AK chinook salmon intercepted by mothership fleet. The difference between these two estimates results in the estimate of 20,000 Western AK chinooks intercepted in the landbased fishery for 1986.

(4) Preliminary information.

(5) Data not available.

U.S. observers monitored over 80% of the catcher boat landings on motherships in the U.S. FCZ during 1987 which was more than double the 1986 coverage. Independent observations of landings on catcher boats and on motherships in 1987 resulted in close agreement of reported catches. Unfortunately, there were no provisions to allow U.S. observers on the mothership fleet when operating in international waters (e.g. central Bering Sea "doughnut") in 1987.

6.2 Foreign, Joint Venture and U.S. Domestic Groundfish Fisheries

Information on 1987 incidental salmon catches in offshore groundfish fisheries is not available as the fisheries are currently in progress. In 1986, foreign and joint venture groundfish fisheries captured 20,983 and 20,820 salmon (all species) in the Gulf of Alaska and Bering Sea - Aleutian Islands regions, respectively. Annual salmon catches made by these fisheries since 1977 are presented in Tables 8 and 9. Chinook salmon composed a majority of the annual salmon catches made in the Gulf of Alaska groundfish fisheries (99.7% in 1986). Chinook salmon was also the dominant salmon species taken in the Bering Sea - Aleutian Island foreign groundfish fishery (60% in 1986) but chum salmon was the dominant species taken in the joint-venture groundfish fishery in the same region (71% in 1986).

Foreign trawl fisheries operating in the central Bering Sea outside the U.S. FCZ ("doughnut" area) have expanded greatly since 1985. The Japanese have reported a 700,000 m.t. pollock catch in this area during 1986 compared to a catch of 186,000 m.t. in 1985. Their 1987 catch is expected to be similar to 1986 catch levels. Other foreign nations are believed to be fishing in this area, but their catches are unknown. It is speculated that the total catch of groundfish (including walleye pollock) by all nations in this area may currently exceed 1,000,000 mt. The incidental catch of salmon, especially chinook salmon of western Alaska origin, which are known to be abundant in the area, is undocumented.

Table 8. Estimated incidental catches (numbers and metric tons) of salmon (Oncorhynchus spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea/Aleutian Islands region, 1977-86. (a)

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	47,840	198	NF	NF	47,840	198
1978	44,548	137	NF	NF	44,548	137
1979	107,706	340	NF	NF	107,706	340
1980	120,104	381	1,898	7	122,002	388
1981	42,337	137	854	3	43,191	140
1982	21,241	85	2,382	8	23,623	92
1983	18,173	66	24,493	54	42,666	120
1984	16,516	51	67,622	160	84,138	211
1985	10,003	33	10,420	30	20,423	63
1986	1,643	5	19,340	66	20,983	71

(a) Estimated catches for years 1977-85 from Berger et al., 1987.
NF = No fishing.

Table 9. Estimated incidental catch (numbers and metric tons) of Pacific salmon in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-86. (a)

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	5,272	19.30	NF	NF	5,272	19.30
1978	45,603	131.27	(b)	(b)	45,603	131.27
1979	20,410	68.69	1,050	2.31	21,460	71.00
1980	35,901	106.90	168	1.07	36,069	107.97
1981	30,860	95.89	0	0.00	30,860	95.89
1982	5,556	18.89	1,411	2.77	6,967	21.66
1983	9,621	31.76	4,253	11.98	13,874	43.74
1984	12,001	36.13	63,845	168.97	75,846	205.10
1985	365	1.64	13,737	38.86	14,102	40.50
1986	0	0.00	20,820	53.72	20,820	53.72

(a) Estimates for years 1977-85 are from Berger et al., 1987.

(b) No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

The numbers of salmon taken by the U.S. domestic groundfish trawl fleet is not known. In 1986 this fishery accounted for 143,300 mt of groundfish which represented 8% of the total groundfish catch made by all nations in the Gulf of Alaska and Bering Sea - Aleutian Island regions.

6.3 Other Fisheries

6.3.1 Alaska Peninsula

The majority of salmon captured during June in the Unimak and Shumagin Islands area, located on the south side of the Alaska Peninsula, are bound for terminal fisheries in the northern Gulf of Alaska and in the Bering Sea, including the Yukon River. These stock origins have been determined by several tagging studies, including the 1987 study reported in Section 7.1.7, and a 1983 scale patterns analysis atudy. Sockeye salmon ia the target species in the June fishery, but relatively large incidental catches of chum salmon are also made. The sockeye salmon harvest is regulated by a quota that is annually adjusted according to the abundance of Bristol Bay sockeye. A 400,000 chum salmon quota was in affect during 1986, but the quota was not extended to the 1987 fishery. A total of 815,000 sockeye and 458,700 chum salmon was taken in the June 1987 fishery. This compares to the 1986 catch of 466,000 sockeye and 344,000 chum salmon. The previous five-and-ten year average chum salmon harveats for this fishery are 608,000 (1982-1986) and 448,000 (1977-1986), respectively.

6.3.2 Norton Sound

A commercial harvest of 7,080 chinook salmon was taken in coastal Norton Sound waters in 1987. Some Yukon River chinook salmon are known to be intercepted in this fishery. The previous five and ten year average harvests are 10,100 (1982-1986) and 9,000 (1977-1986) chinook, reapectively.

6.4 ADF&G Contracted Report on Interceptions of Yukon Salmon by High Seas Fisheries

Estimatea of the regional stock compositions of chinook salmon in the Japanese mothership fishery were made from scale pattern analyses by year (1975-1981), age (1.2 and 1.3), month (June-July), and INPFC sub-area. Stock compositions were then calculated on an annual basis for the Bering Sea and North Pacific areas of the fishery by weighting the age/month/sub-area estimates by the catches. The annual catches of western Alaskan chinook salmon were calculated from the proportion of western Alaskan stocks and the total catch including un-aged and mature fish.

The proportions of Yukon stocks were calculated in a similar manner from stock compositions estimated by six-region analyses (Asia, Yukon, Kuskokwim, Bristol Bay, Central Alaska, and Southeastern Alaska/British Columbia). The proportions of Yukon, Kuskokwim, and Bristol Bay stocks were recalculated to total one, and then the proportions of Yukon stocks were applied to the western Alaskan components of the Japanese mothership catches to estimate the interception of Yukon origin chinook salmon. The results of the INPFC tagging experiments were used to determine the relative vulnerability of Yukon chum salmon to interception fisheries by examining the tag returns with information on run timing and the approximate abundance of contributing stocks. It waa not possible, however, to estimate numbers of Yukon chum salmon intercepted by these fisheries.

Annual catches of Yukon River origin chinook salmon in the Japanese landbased and mothership high seas gillnet fisheries have averaged 46,000 fish during the 1982-1986 period. The recent year catch estimates have totaled 37 and 32 thousand fish for 1985 and 1986 respectively. Estimated high seas harvests of Yukon River origin chinook have been less than 65,000 fish since the historic large catch of 1980, when an estimated interception of 230,000 fish was recorded.

Estimates of total annual escapements of chum salmon for the Yukon River are not available. However, based on the catches since the 1970's it is apparent that the Yukon summer run is the largest run in Western Alaska (about 2 million fish annually). It is followed in magnitude by the Nushagak run and then the North Peninsula, Kuskokwim, and Yukon River fall runs, which are probably of comparable magnitude and typically number about 1 million per year. The Kotzebue run has probably averaged about a half million fish annually as have the Togiak run and the other Bristol Bay runs combined since 1977.

In summary based on results of the high seas tagging studies it is evident that all of the western Alaskan stocks of chum salmon have probably contributed fish to both the Japanese and False Pass fisheries. The extent to which the various stocka have been impacted by the interception fisheries is largely unknown.

7.0 1987 Project Summaries

7.1 Harvest Monitoring and Apportionment

7.1.1 Commercial Catch Monitoring

Commercial salmon catches in Alaska were monitored by ADF&G on an in-season basis by the verbal report of catches from processors required by regulation within 18 hours of the closure of any commercial fishing period, and by the subsequent computer processing of harvest sales receipts (fish tickets). Data were keypunched on microcomputers in the Emmonak field office for the lower Yukon area, and in the Fairbanks office for the upper Yukon area. Tablular summaries of catch and effort data by district and statistical area were then generated for each fishing period and for the total season to date. The verbal reports and subsequent catch data summaries allowed ADF&G managers to make timely in-season adjustments to harvest strategies in response to stock strength and performance indicators of the fisheries. Harvest data for 1987 are presented in the fishery description section of this report.

Commercial catch data in the lower fishery district of Canada (Sixty Mile River to US/Canada Border) was collected on a daily basis by the patrolman (assistant Fishery Officer) stationed in Dawson for the entire fishing season. Roughly ninety percent of the fishing effort occurs in this district. Individual catch information was compiled at the end of each fishing period to provide weekly catch and effort summaries. Sales slips were also collected on a weekly basis from the Han Fisheries processing facility in Dawson and from those fishermen who made local sales.

Catch data for the upper fishing area (Sixty Mile River to Tatchun Creek) was compiled from catch cards which were either mailed in to the Whitehorse office of DFO or picked up from individual fishermen by the patrolman or fishery officer. Patrols in this area were conducted approximately two times per month.

7.1.2 Commercial Catch Sampling

Commercial salmon catches in Alaska were sampled for age-sex-size data at Emmonak, St Marys, and Marshall in the lower Yukon Area, and at Galena, Nenana, Fairbanka, and the area between Rampart to Haul Road Bridge in the upper Yukon Area. Samples collected in Districts 1 and 2 were processed during the field season, while those collected in the other districts are being processed at this time.

Chinook salmon harvested in the District 1 and 2 commercial fishery were approximately 76% age 6, 7% age 5, and 13% age 7. The proportion of age 6 fish in the total season commercial catch was similar to the proportion taken in 1985 which had the greatest contribution of age 6 fish during recent years. The proportion of age 5 fish was lower than in most years, being similar to 1985.

Typically, 4-year-old summer chum salmon account for the majority of the catch for any given fishing period, increasing in relative importance as the run progresses. This was the case during 1987 with age 4 and 5 fish accounting for approximately 54% and 38% of the District 1 summer chum salmon catch, respectively. The harvest of summer chum salmon taken during unrestricted mesh size periods (June 15-29) was composed of a higher proportion of age-5 fish (45%) than during restricted mesh size periods (35%) which occurred between June 29 and July 10.

Samples from the test fishery for fall chum indicated that the early segment of that run was composed of a greater than usual proportion of age-4-fish. It appears that the relative contribution of age-5 fish to the return was low. Based on lower river test fish samples weighted by daily catches, age 4 and 5 fish accounted for 83% and 15% of the run, respectively. Spawning area escapement age composition samples, which are currently being collected, will be of increased importance compared to previous years due to the lack of commercial catch samples.

Typically, age-4 coho salmon account for 70% or more of the samples collected. The 1987 contribution of age-4 coho salmon, based on test fishing catch samples, comprised only 60% of the return. The unusually high contribution of age-3 fish (34%) may reflect a strong contribution from the 1984 parent year which was above average in magnitude.

Commercial salmon catches in the Canadian fishery were also sampled for age-sex-size composition for both chinook and chum salmon. During the fishing season, a sampler was stationed in Dawson City to sample a portion of the catch delivered to the Han Fisheries plant. Approximately 350 chinook and 500 chum salmon were sampled. Post season analysis of these samples will commence in late October.

7.1.3 Subsistence Fishery Surveys

Subsistence fishery catches in Alaska are estimated after the season by conducting interviews with fishermen in selected villages and contacting others with mail-in questionnaires. Data are compiled and expanded for those fishermen for whom catch information cannot be obtained. Funding was made available in 1987 to continue the expanded interview program, attempting to contact subsistence fishermen in all of the major fishing communities in the area. Catch calendars were also mailed to all known subsistence fishermen upon which to record their daily catch by species and thereby improve the accuracy of the harvest estimate and obtain fishery timing data. Calendars were collected during the village interviews and postage was guaranteed for those returned by mail. Villages in Districts 1-3 have been surveyed and postal questionnaires mailed to those not contacted. Villages in Districts 4-6 will be surveyed in mid-October. Harvest estimates should be available by December 1987.

In 1986, full funding was available to survey the subsistence catch in 38 villages, measure the precision of the estimated harvest and investigate the estimate's accuracy. Overall 78% of those known to subsistence fish were surveyed for catch and effort data. The estimated drainage-wide harvest and approximate 95% confidence intervals were 45,238 ± 1,023 chinook salmon; 290,815 ± 14,006 summer chum; 164,043 ± 6,880 fall chum and 34,468 ± 3,436 coho salmon. Monitoring of catch and effort by staff resident during the fishing season compared well with postseason survey results in two villages.

In-season monitoring of the Canadian subsistence (Indian food fishery) was continued in 1987. Catch calendars and individual licenses were distributed by hand to each fisherman early in the season. Several visits (average of four) were subsequently made to interview fishermen and obtain catch data and retrieve spaghetti tags. Specific catch information was recovered from approximately 90% of the subsistence fishermen. Catches from the remaining 10% were estimated from interviews of associate fishermen.

7.1.4 Sport Fishery Surveys

The salmon sport fishery harvest in the Tanana River drainage is estimated each year through a postal survey of licensed fishermen. Creel censuses of the Salcha River sport fishery provide an independent method of verification. Data from these two projects are not yet available for 1987. Tanana River sport fishing harvests in 1986 were preliminarily estimated to total 781 chinook salmon, 693 chum salmon, and 1,324 coho salmon. The 1986 creel census for the Salcha River sport fishery estimated a harvest of 526 chinook salmon with a 95% confidence interval of 423 fish.

Sport catch estimates in Canada were derived from regular enforcement patrols conducted throughout the accessible portion of the drainage.

7.1.5 Chinook Salmon Catch Apportionment

Analysis of scale patterns, age compoaitions, and geographic distribution of 1986 Yukon River chinook salmon catches and escapements were used by ADF&G to apportion commercial and subsistence harvests to geographic region of origin. These data were not available at the April 1987 meeting of the US/Canada delegations, and are therefore briefly summarized here. Geographic contribution to total Yukon River utilization of chinook salmon in 1986 was estimated at approximately 112,000 (68%) upper run, 44,000 (27%) lower run, and 9,000 (5%) middle run fish. The fraction of the Districts 1 and 2 commercial catch apportioned to the lower run generally increased during the period of the analysis while the fraction apportioned to the upper run generally declined.

For the preceding four years of this study (1982-1985), estimates of contribution to total drainage harvest ranged between 35.3% and 62.1% for the upper run, between 19.5% and 36.4% for the middle run, and between 12.2% and 30.9% for the lower run. While the lower run contribution estimate for 1986 falls within the range of previous results, the upper run contribution estimate was the highest and the middle run contribution estimate was the lowest in the five-year study. A new project biologist digitized the scale samples for 1986, but no statistically significant sources of error could be found in comparison tests with the previous digitizer that would explain these unusual run contribution estimates.

The catch apportionment study was continued by ADF&G in 1987, while a protein electrophoresis study was initiated by the USFWS for chinook salmon. Scale and tissue samples were collected by ADF&G and USFWS from commercial and test fishing catches in Districts 1 and 2. Age and sex composition data were compiled in-season for use by the fishery managers. Scale samples were also collected from harvests in Districts 4, 5, and 6 by ADF&G and in Yukon Territory by DFO. These data are processed after the season. Escapement scale and tissue samples were collected from the Andreafsky, Anvik, Nulato, Gisasa, Koyukuk, Chena and Salcha Rivers in Alaska. Canadian samples were collected from 470 adult chinook salmon form 8 locations: mainstem Yukon, Tatchun Creek, Big Salmon River, Little Salmon River, Bearfeed Creek, Teslin River, Nisutlin River, and the Whitehorse hatchery. Samples were collected from 1,350 juvenile chinook salmon from 13 locations: Takhini River, Nisutlin River, Blind Creek, Bearfeed Creek, Little Salmon River, Nordenskjold River, Tatchun Creek, Pelly River, Ross River, Mayo River, McQuesten River, North Klondike River, and Morley River.

Preliminary results from the 1987 study are not expected until April 1988 or thereafter. Methods of combining results from the two stock identification techniques will be investigated. This may yield more accurate and precise estimates of stock contribution than can be obtained with either technique alone.

A new method of stock identification, one based on variation in DNA in the cell nucleus, is being evaluated by DFO for chinook salmon and possibly chum salmon. If sufficient variation in nuclear DNA can be detected in a feasibility trial, then the electrophoretic samples collected in 1987 will also be examined for DNA variation.

7.1.6 Chum Salmon Catch Apportionment

The fall chum salmon protein electrophoresis study, initiated by DFO in 1984, was continued by USFWS in 1987, and expanded to include summer chum salmon stocks for the first time. In addition, USFWS will screen a larger number of enzymes than had been examined previously. The scale patterns analysis (SPA) method is being applied to summer and fall chum salmon stocks by ADF&G for the second consecutive year. Results of these studies through 1986 were summarized to the delegations in April 1987. Data for 1987 are still being collected and preliminary results are not expected

until April 1988 or thereafter. Methods of combining results from the two stock identification techniques will be investigated.

Chum salmon were sampled for scales and tissues by ADF&G and USFWS from commercial and test fishing catches in District 1, and from escapements to the Andreafsky, Anvik, Nulato, Koyukuk, Sheenjek, Chandalar, Toklat, Delta, and mainstem Tanana Rivers. Vertebrae were collected from some of the escapement samples for positive age determination. Sampling has not yet been concluded for some of the fall chum salmon escapement populations. Canadian stocks anticipated to be sampled for tissues include the Fishing Branch, Kluane, mainstem Yukon River at Minto, and the Teslin Rivers. Data from the 1987 study will be added to those collected during 1984-86 and estimates made of the stock composition of the weekly samples in the Emmonak test fishery.

7.1.7 South Alaska Peninsula Tagging Study

The objective of this new 1987 study was to determine migration timing and final destination of chum and sockeye salmon that pass through the Unimak and Shumagin Islands commercial gillnet and purse seine fisheries located on the south side of the Alaska Peninsula. The Alaska Department of Fish and Game contracted LGL Alaska Research Associates to perform the tagging portion of the study. Between June 6 and July 2, 6,345 chum and 7,202 sockeye salmon were captured by chartered purse seine vessels and tagged (Table 10). Tagging occurred during closed commercial fishing periods. The fish were tagged with orange or yellow spaghetti tags.

The contractor distributed publicity materials to the press and foreign agencies describing procedures for returning recovered tags. ADF&G distributed an operational plan describing the study, including forms for recording tag recovery information to all management areas. ADF&G sent pre-addressed, postage paid envelopes to all segments of the fishing industry to ensure return of recovered tags. All recovered tags were to be accompanied with information identifying the species caught, date and location of recovery. A $500.00 lottery was also arranged as an incentive

Table 10. Date and quantity of tags deployed in the area of the South Alaska Peninsula June salmon fisheries, 1987(a).

Date	Shumagin Islands		South Unimak District		Total South Peninsula
	Sockeye Salmon	Chum Salmon	Sockeye Salmon	Chum Salmon	Total Fish Tagged
June 6	121	73			194
7			3	29	32
8	42	50			92
9					0
10					0
11					0
12	37 (39)	30			67
13			506	368	874
14					0
15					0
16	461 (705)	97 (98)	165	90	81
17					0
18	207 (404)	537 (541)	175	69	988
19	0 (134)	114 (115)	519	384	1,017
20					0
21					0
22	329 (631)	383 (393)			712
23			807	650	1,457
24			1,253	895	2,148
25					0
26					0
27	172 (1,442)	372 (651)	1,004	544	2,092
28	100 (283)	315 (445)	1,055	375	1,845
29					0
30					0
July 1	56 (273)	543 (549)	148	50	797
2	42 (88)	330	0 (211)	47	419
Subtotal	1,567 (3,801)	2,844 (3,275)	5,635 (5,846)	3,501 (3,501)	13,547 (16,423)

Total Fish Tagged	Sockeye Salmon	Chum Salmon	Total
	7,202 (9,647)	6,345 (6,776)	13,547 (16,423)

(a) Numbers in parenthesis are numbers of fish captured when not all fish captured were tagged.

for tag returns. ADF&G also stationed crews in the Alaska Peninsula, Bristol Bay, Kuskokwim River, Yukon River and Kotzebue areas to interview fishermen as they delivered their catch. Crew members also examined catches to recover any tags that were bypassed.

Recovery efforts specific to the Yukon River included interviews of commercial fishermen harvesting summer chum salmon in Districts 1 and 2. Because of the absence of a commercial fishery for fall chum salmon in the Alaskan portion of the drainage, interview efforts were concentrated on subsistence fishermen in Districts 1 and 5. Project leaders of all escapement monitoring and test fishing projects for summer and fall chum salmon were notified of the study and watched for tagged fish. The Canadian Department of Fisheries and Oceans in Whitehorse and the U.S. Fish and Wildlife Service with offices in Fairbanks and Anchorage were also informed of the study and assisted with tag recovery efforts.

Chum salmon tag recoveries have been made in all Bering Sea management areas as far north as Kotzebue. A few recoveries were reported in Gulf of Alaska areas as far south as Prince William Sound. As of October 7, a total of 19 chum salmon tag recoveries have been reported in the Yukon River in Alaska. To date, recoveries have not been reported from Canada, Asia or the high seas although a salmon with a yellow sphagetti tag was observed in the Porcupine River.

Tag recoveries are still being reported, the contractor is computerizing the tag release information and ADF&G is processing data obtained from the interview program. Study results will be released in December of this year during the Alaska Board of Fisheries meeting.

7.2 Run Abundance Indicators

7.2.1 Lower Yukon Test Fishing

Salmon run timing, abundance, and entry patterns are indexed by ADF&G with set gillnets in the Yukon River delta. Samples are collected from test net catches during commercial fishery closures to determine age-sex-size composition of salmon escaping the commercial fishery. The project is essentially unchanged since 1980.

Chinook and summer chum salmon were indexed using 8-1/2 inch (21.6 cm) and 5-1/2 inch (14.0 cm) gillnets from June 2 through July 15. Chinook salmon run timing was normal. Peak catches occurred on June 13, 22, and 30, with

the chinook salmon entry being steady and of extended duration when compared to most other years. Overall run strength was above average in magnitude, similar to that of 1981 during which 158,000 chinook salmon were commercially harvested in Alaska and good spawning escapements were documented throughout the Yukon River drainage. Summer chum salmon run timing was normal. Catches were moderate throughout the season with peak catches occurring June 12-15 and 18-21. Overall run strength was below average, similar to that of 1982 and 1983.

Fall chum and coho salmon were indexed using 6 inch (15.2 cm) gillnets from July 16 through August 28. Overall run magnitude was below average. The first two weeks of the run were especially weak. Peak season catches occurred on July 30 and 31 and Auguat 3 and 19. The total season cumulative index was above that of 1982 and 1984 and very similar to 1985. The coho salmon run was late and appeared to be average to slightly below average in magnitude. Significant daily catches did not occur until August 8, and the peak catch was on Aguust 23. On termination of the test fishing projects, there was no indication of diminishing coho salmon run strength.

7.2.2. Upper Yukon Test Fishing (Alaska)

Fall chum and coho salmon run timing and abundance in the upper Yukon area has been indexed with fishwheels on the north (1981-1987) and south bank (1981-1986) of the Yukon River near Ruby. Tagging studies conducted from 1976 to 1978 indicated that fall chum salmon migrating along the north bank at this site were primarily bound for spawning areas in the upper Yukon and Porcupine River drainages, while those moving along the south bank were bound primarily for Tanana River drainage spawning areas.

Operation of the south bank test fishwheel was eliminated in 1987 in response to misleading information gained from the project during 1986. High catches made in the south bank fishwheel during 1986 suggested a strong return to the Tanana River, however resulting catches and spawning area escapements were extremely low.

The north bank fishwheel was operational from August 4 through September 20 in 1987. Peak fall chum salmon catches occurred on August 17, 18, and September 8-10. The early portion of the run was weak, as had been documented by lower river test fishing and sonar enumeration projects. Overall fall chum salmon run strength appeared to be average, with catches improved from those of 1982 and 1984 but below those of other years for corresponding periods of project operation.

Due to the small number of coho salmon captured in the north bank fishwheel, it is not appropriate to use the catch data to judge run strength.

7.2.3 Yukon River Sonar

Hydroacoustic counters were operated by ADF&G on the mainstem Yukon River near Pilot Station (River Mile 122) from June 9 through September 6 in 1987. Sonar counts were apportioned to species based on test fishing catches using drift gillnets of several different mesh sizes. Species apportionment estimates are being refined on a post-season basis to generate final daily and total season population estimates by species.

Preliminary in-season sonar counts totaled approximately 656,000 summer chum salmon, 110,000 chinook salmon, 587,000 fall chum salmon, and 240,000 coho salmon in 1987. The chinook salmon estimate is the largest since the project was initiated in 1985, while the summer chum salmon estimate is the smallest. Unstable river bottom conditions throughout the month of June probably resulted in incomplete enumeration of chinook and summer chum chum salmon passage. Counts for those species are considered conservative estimates at this time. The fall chum salmon salmon estimate is slightly improved from the 1985 count of 544,000 fish, while the coho salmon estimate is the largest of the period 1985-87. Fall chum salmon sonar counts in 1987 were well correlated with set gillnet test fishing catches in the Yukon River delta and with drift gill net test fishing catches at the sonar site. Significant coho salmon passage occurs after the project is terminated each year, therefore the incomplete escapement counts may not be directly comparable between years.

7.2.4 Upper Yukon Test Fishing (Yukon Territory)

Run timing and relative abundance data were collected by DFO for both chinook and chum salmon from three fishwheels located near the U.S./Canada border. Although the primary purpose of the fishwheels was to capture salmon alive for the tagging program, consistency in site selection and fishing time since 1982 does provide the opportunity for some inter-annual and in-season comparisons. In 1987, the fishwheel catch data indicated the chinook run timing was similar to that of 1986. However, unlike 1986, a bimodal catch distribution was apparent in 1987 with peaks generated in weeks ending July 18 and August 1. In 1986, a single peak of much greater magnitude occurred during the week ending July 25. In isolation, the 1987 cumulative fishwheel catch indicated a run size of approximately 50% of the 1986 return although the preliminary tag recapture population estimate is slightly higher than 1986 (38,947 in 1987, 36,479 in 1986). The comparative weekly catches in the commercial fishery also suggested a run size in excess of the 1986 run whereas escapement indices as previously discussed showed both above, average and below average returns to different parts of the watershed. Reasons for these disparities are not well understood at this time.

In general, the 1987 fall chum salmon return appeared to be approximately one week later than in 1986 although small numbers of chum first appeared in both the DFO fishwheels and in the commercial catch in mid-July, at least two weeks earlier than last year. The 1987 run appears to be more protracted than usual with a second peak in daily fishwheel catches

occurring in late September. Total fishwheel catches to date and preliminary population estimates derived from tagging data currently indicate a run size slightly smaller than the 1986 estimate (94,000 in 1987, 102,000 in 1986).

7.2.5 Upper Yukon Tag and Recovery Program

A tagging program has been conducted on salmon stocks in the Canadian section of the drainage since 1982 by DFO. The objectives of the study have been to estimate the total return of chinook and fall chum salmon to Canada (excluding the Porcupine drainage) and obtain estimates of total escapement, harvest rates, migration rates and run timing. Spaghetti tags are applied to salmon live-captured in the test fishwheels and subsequent recoveries are made by the different user groups fishing upstream. Population estimates are derived from those tags recovered in the lower commercial fishing area. Analysis of the 1987 data is not yet complete, however a preliminary chinook salmon population estimate of 38,947 has been calculated. Of this number, 21,516 have been estimated to have escaped to spawning grounds. For comparison, population and spawning escapement estimates for all preceding years are as follows:

Year	Total Catch	Porcupine Catch	Canadian Upper Yukon Catch	Upper Yukon Spawning Escapement	Upper Yukon Border Escapement
1982	16,908	400	16,508	20,090	36,598
1983	18,652	200	18,452	29,289	47,741
1985	19,001	150	18,851	11,030	29,881
1986	20,064	300	19,764	16,715	36,479

The preliminary population estimate for chum salmon in 1987 is 93,820. Of this number approximately 60,000 have been estimated to have escaped to spawning grounds as of October 1. These numbers are based at present on incomplete data as the run is still in progress. For comparison, population and spawning escapement estimates for all preceding years are as follows:

Year	Total Catch	Porcupine Catch	Canadian Upper Yukon Catch	Upper Yukon Spawning Escapement	Upper Yukon Border Escapement
1982	16,091	1000	15,091	34,780	49,871
1983	29,490	2000	27,490	90,875	118,365
1985	41,265	3500	37,765	62,010	99,775
1986	14,536	700	13,836	87,990	101,826

7.3 Spawning Escapement Studies

7.3.1 Andreafsky River Tower

Salmon escapement to the East Fork Andreafsky River was enumerated by ADF&G using counting towers in 1987, and fish were sampled by beach seine and carcass survey for age-sex-size data.

An expanded total of 45,221 summer chum salmon, 2,011 chinook salmon, and 676 pink salmon was counted from June 25 through July 25. Age composition data are not yet available. The summer chum salmon estimate was the smallest total season count recorded for this stream since the study was initiated in 1981, and was 67% below the previous average of 135,400 fish. The chinook salmon estimate exceeded the incomplete estimate of 1,530 fish in 1986. Pink salmon are more abundant in even-numbered years.

7.3.2 Anvik River Sonar

Summer chum salmon escapement to the Anvik River was enumerated by ADF&G using side-scanning sonar in 1987 for the ninth consecutive year.

An adjusted total of 455,876 summer chum salmon was counted from June 21 through July 26 in 1987. Fish were sampled by beach seine and carcass survey for age-sex-size data. The 1987 escapement estimate is 26% greater than the parent year escapement in 1983, but is 6% below the escapement objective of 487,000 fish and 27% below the long term (1972-1986) average of 628,000 fish. Age composition data are not yet available.

7.3.3 Chena River Chinook Salmon Tagging Study

A chinook salmon tagging study was conducted by ADF&G in the Chena River, tributary to the Tanana River, to estimate population size. Set gillnets

(both 5-3/4" and 8-1/8" mesh) were monitored at several sites near mile 15 of the Chena River. Approximately 517 chinook salmon were tagged and released in good condition between July 1 and 31, 1987. Fish were placed in a pen until they had recovered from handling before being released. The tagged fish were recovered later by intensive repeated carcass surveys from August 1-20. Over 94 tagged chinook salmon were recovered, and additional fish were sampled for age-sex-size data. A population size estimate is not yet available.

In 1986, the population size was estimated to be 9,065 with a 95% confidence interval of 2,115 fish.

7.3.4 Salcha River Chinook Salmon Tagging Study

A chinook salmon tagging study was conducted by ADF&G in the Salcha River, tributary to the Tanana River, to estimate population size. Set gillnets were monitored at several sites in the lower Salcha River from July 3-31. Clear and very low water levels resulted in extreme net avoidance and only 93 chinook salmon were tagged. An additional 288 chinook salmon were captured by electrofishing, tagged, and released within the lower 60 miles of the river from July 31 to August 2. A total of 860 fish were subsequently sampled for tags during the recovery period of August 10-19. High water hindered tagging from July 15-20 and 25-27, and recovery of tags after August 20. A population size estimate is not yet available.

7.3.5 Sheenjek River Sonar

ADF&G has operated a side scanning sonar project to enumerate fall chum salmon escapement in the Sheenjek River (Porcupine River system) since 1981. A preliminary sonar count this year of 130,000 was obtained from August 25 until September 25. This count does not include an estimate of fish passage through the unsonified mid-channel section of the river. When this estimate is completed and included, the total estimated 1987 escapement should approximate 150,000 fall chum salmon, which rivals the record escapement count made in 1985. Annual escapements since 1981 have ranged from a low of 27,130 (1984) to a high of 152,768 (1985). Annual escapements since 1985 have exceeded the interim escapement objective of 62,000 recently established for this stream.

Sampling objectives for age-sex-size composition and stock identification studies (scales and electrophoretic tissue samples) were achieved this year. Project personnel conducted foot and boat surveys of major spawning areas during late September to obtain tag recovery and associated information.

7.3.6 Chandalar River Sonar

A side scanning sonar project was operated by USFWS for the second consecutive year in the Chandalar River to obtain an estimate of the fall chum salmon escapement. In 1987 the estimated escapement was 48,744 fall

chum salmon, compared to the 1986 escapement of 59,313 fish. Sonar counts for both years were obtained using similar equipment and methods. However, daily fish passage during the last day of sonar operation was higher in 1987 (1000/day) than in 1986 (500/day).

A radio telemetry study was also conducted by USFWS in this stream during 1987 to determine the location of the major salmon spawning areas. Radio tags were implanted in 13 chinook salmon and 15 fall chum salmon captured in gillnets. The chinook salmon were captured during an earlier test fishing project. A majority of the radio tagged fish of both species were located by tracking radio signals from aircraft. A majority of tagged fish (both species) were found utilizing spawning areas within the lower 70 miles of the main Chandalar River. A majority of the radio tagged fall chum salmon were located in clear water spring areas in the vicinity of the village of Venetie. A smaller number of fall chum salmon were found apparently spawning in turbid water areas where direct observation from aircraft was not possible.

Another radio telemetry study was conducted by USFWS in the Black River, a tributary of the Porcupine River system located downstream of the Sheenjek-Porcupine River confluence. Six fall chums were radio-tagged and subsequent tracking by aircraft indicated wide distribution of these fish in the Black River drainage.

7.3.7 Whitehorse Fishway Chinook Enumeration

A total of 327 chinook salmon was enumerated at the Whitehorse Fishway in 1987 (Table 11). This represents 36% of the 1981-1985 average of 899 fish. The daily counts are not broken down by sex at this time. Of the total run of 327 chinook, 71 females and 42 males were taken for hatchery brood stock. These chinook were sampled for age-size-sex data and tissue

Table 11. Chinook counts, at the Whitehorse fish ladder in 1987.

Date		Daily	Cumulative
July	29	1	1
	30	2	3
	31	0	3
August	01	0	3
	02	1	4
	03	1	5
	04	3	8
	05	5	13
	06	8	21
	07	3	24
	08	2	26
	09	12	38
	10	7	45
	11	4	49
	12	2	51
	13	7	58
	14	30	88
	15	12	100
	16	21	121
	17	23	144
	18	28	172
	19	15	187
	20	25	212
	21	39	251
	22	22	273
	23	15	288
	24	9	297
	25	11	308
	26	5	313
	27	8	321
	28	2	323
	29	3	326
	30	1	327
	31	0	327

samples were taken for electrophoretic analysis. Run timing appeared slightly delayed with 50% of the count being recorded by August 18 as compared to August 12 in 1986. The first chinook appeared on July 29 and the peak count of 39 occurred on August 21.

7.3.8 Big Salmon River Chinook Weir

A total of 998 chinook salmon was counted through the Big Salmon River weir between July 28 and September 2, 1987. Thia represents 55% of the 1986 weir count of 1,816 fish. The weir count in 1985 was 456 chinook salmon. However delays in weir installation precluded complete enumeration of the first half of the 1985 run.

Peak migration occurred during the first two weeks in August in both 1986 and 1987. The peak daily count of 149 fish occurred on August 9 in 1987. Fifty percent of the run had passed through the weir by August 10. Run timing in 1987 was very similar to 1986. Daily and cumulative counts appear on Table 12.

The daily number of carcasses drifting back against the weir was recorded, but this data is not available at this time. Stream residence time appears to be approximately 2 weeks, similar to that in 1986.

Approximately 20% of the run was sampled for age-size-sex data and approximately 150 tissue samples were taken from spawned out adults for electrophoretic analysis.

7.3.9 Fishing Branch River Chum Weir

A weir to enumerate fall chum salmon escapements to the Fishing Branch River (Porcupine drainage) was operated from 1972 to 1975. Counts during this period ranged from 16,000 to 353,000 fall chum salmon. This program was re-established in 1985 and continued through 1987. The 1985 count was 56,016 fish (56.3% females) during the period from September 6 to October 20. In 1986 the weir was operational September 1 through October 19. A total of 31,378 (54% females) fall chum was enumerated. This count represented 56% of the 1985 return. The 1987 weir count as of October 1 was 41,381 fish, with daily counts of approximately 850 chum at this time. The 1987 weir count is expected to reach 52,000 to 55,000 fish. A total of approximately 850 chum salmon will be sampled live at the weir, and 150 tissue samples will be taken on spawned out chum salmon for electrophoretic analysis. Run timing in 1987 appeared to be approximately mid-way between that of 1985 and 1986, with peak counts on September 30 in 1985, September 9 in 1987, and September 19 in 1987 (preliminary).

Table 12. Chinook counts at the Big Salmon River weir in 1987.

1987 DATE		LIVE COUNT	CUMULATIVE COUNT
July	29	0	0
	30	7	7
	31	3	10
August	01	24	34
	02	11	45
	03	29	74
	04	45	119
	05	134	253
	06	9	262
	07	48	310
	08	38	348
	09	149	497
	10	33	530
	11	50	580
	12	75	655
	13	43	698
	14	24	722
	15	36	758
	16	26	784
	17	50	834
	18	28	862
	19	36	898
	20	24	922
	21	17	939
	22	19	958
	23	5	963
	24	6	969
	25	14	983
	26	5	988
	27	1	989
	28	5	994
	29	3	997
	30	0	997
	31	0	997
September	01	0	997
	02	1	998

7.3.10 Escapement Surveys

Salmon escapement abundance is indexed at selected spawning areas throughout the drainage by aerial surveys from fixed wing aircraft (ADF&G) and helicopter (DFO). Results from those surveys conducted to date are presented in the stock status section of this report.

All chum and coho salmon escapement surveys have not yet been conducted. In addition to aerial surveys from aircraft, intensive replicate ground surveys on several important fall chum salmon populations are planned. These include the Toklat, Delta, mainstem Tanana and Kluane River as well as selected slough areas of the Tanana River and the mainstem Yukon in Canada. Samples will be collected during ground surveys for age-sex-size data and electrophoresis tissues.

8.0 Interim Spawning Escapement Objectives for the Fishing Branch Fall Chum Salmon Stock

Interim spawning escapement objectives were established for mainstream chinook and chum salmon stocks in the Canadian portion of the Yukon River drainage at the April 1987 meeting of the Canada/U.S. Yukon River Technical Committee. However, the Technical Committee was unable to agree on an objective for the Fishing Branch River stock. This subject was reviewed again at the October 1987 meeting of the Technical Committee.

The discussion on interim escapement objectives for Fishing Branch River fall chum salmon began with the presentation of the following information:

Escapement of Fall Chum Salmon in the Sheenjek and Fishing Branch Rivers: 1974-1986

	Sheenjek River			Fishing Branch River		
1974	89,966 *	69713[1]	69727[4]	32,525 w	103822[1]	71513[4]
1975	173,371 *			353,282 w		
1976	26,354 *			36,584 **		
1977	45,544 *	52436[2]		88,400 **	62246[2]	
1978	32,449 *			40,800 **		
1979	91,372 *			119,898 **		
1980	28,933 *		61090[5]	55,268 **		48032[5]
1981	74,560 s			57,386 **		
1982	31,421 s			15,901 **		
1983	49,392 s	69745[3]		27,200 **	33818[3]	
1984	27,130 s			15,150 **		
1985	152,768 s			56,100 w		
1986	83,197 s			31,173 w		
1987	150,000(6)			(7)		

1) average for 1974 to 1980 inclusive
2) average for 1974 to 1980 excluding 1975
3) average for 1981 to 1986 inclusive
4) average for 1974 to 1986 inclusive
5) average for 1974 to 1986 excluding 1975
6) preliminary
7) not available

s = sonar count
w = weir count
* = expanded aerial survey count based on sonar/aerial count relationship of 2.22 for Sheenjek River.
** = expanded aerial survey count based on weir/aerial count relationship of 2.72 for Fishing Branch River.

It was noted that the average escapement to the Fishing Branch River declined from a level in excess of the average Sheenjek River escapement from 1974 to 1980, to less than half of the Sheenjek River escapement from 1981 to 1986. Although the decline in Fishing Branch River escapement was large, the Committee was unable to isolate the cause for the decline. Sheenjek River fall chum salmon escapements were relatively stable over the 1974 to 1986 period.

The Committee next considered the relationship between U.S. catch of fall chum salmon (all stocks combined) in year t and Fishing Branch River

escapement in year t-4 (it was assumed for this exercise that all Fishing Branch River fall chum salmon mature at age 4). It was noted that U.S. catches in the range of 300,000 to 400,000 fall chum salmon were associated with a brood year escapement to the Fishing Branch River of between 15,000 and 55,000 fish; a U.S. catch in the range of 400,000 to 500,000 fish was associated with brood year escapements in the range of 37,000 to 56,000 fish; a U.S. catch in the range of 500,000 to 600,000 fish was associated with an escapement of 120,000 fish; and U.S. catches greater than 700,000 fish were associated with brood year escapements between 90,000 and 353,000 fish. Assuming that a reasonably strong and positive relationship exists between the U.S. catch of fall chum salmon in year t and Fishing Branch River escapement in year t-4, it was thought that the lower end of the interim escapement objective range should be set at 50,000 fish. This objective supercedes, but is essentially the same as the 48,000 fish objective that had been estsbliahed by ADF&G after the 1986 season and presented at the April 1987 meeting of the Alaska Board of Fisheries. Establishing the upper end of the range was more difficult as U.S. catches of more than 700,000 were associated with a very broad range of escapements (353,282, 88,400 and 119,898). It was thought that at this time it is not reasonable to consider the escapement of approximately 350,000 fish in 1975 for setting the range. However, the Committee did agree that an upper value of 120,000 (approximately equal to the 1979 Fishing Branch River escapement) was satisfactory, resulting in an interim escapement objective range of 50,000 to 120,000 fall chum salmon.

As in the case of the mainstem chinook and fall chum salmon stocks, setting the interim escapement objective range for Fishing Branch River fall chum salmon was based on the realization that although the "optimum" escapement level is unknown, some recent escapements are clearly inadequate. In concluding the discussion on the interim escapement objective, the Committee felt it was important to note that it is not recommending that the fisheries be managed so as to achieve the midpoint of the range but managed only so that escapements fall within the proposed range.

Therefore, the lower end of the escapement objective range should be considered a minimum threshold level. Fisheries should be regulated such that this level is achieved even in years of weak overall run sizes. Fish that escape to spawn above this level are thought to be equally productive, and would be expected to result in proportionately larger future returns. Fisheries should be regulated such that large overall run aizes do not result in escapements above the upper end of the interim escapement objective range. Fishing Branch River interim escapement objectives will be re-evaluated in the future as described in the JTC report of September, 1986.

9.0 Enhancement

9.1 Clear Hatchery

The Clear Hatchery salmon enhancement program has been greatly curtailed due to the shortage of operational funds. Fall chum and chinook salmon egg takes were discontinued in 1986 and 1987, respectively. A 500,000 coho salmon egg take is scheduled in late September, 1987. Subsequent juvenile coho salmon releases will be divided between the Tanana River system and closed system lakes. Stocking salmon in closed system lakes are intended to enhance sport fishing. Out of a total of 146,000 juvenile chinook salmon released this spring, 100,000 (all adipose fin clipped) were released in the Tanana River and the remainder were stocked in closed system lakes. Out of 564,000 juvenile coho salmon released this spring, 180,000 (27,500 adipose fin clipped) were placed in the Tanana River system and the remainder were placed in closed system lakes.

9.2 Whitehorse Hatchery

Good survival was obtained at the Whitehorse hatchery in 1986. From a total egg take of 371,890 eggs in September, 1986, 290,544 fry were released (June, 1987) for a egg to fry survival rate of 78%. A total of 256,680 fry was released into Mitchie Creek and 33,864 were released into Wolf Creek. All of the fry released into Wolf Creek were coded wire tagged whereas 244,760 (95%) of the fry released into Mitchie Creek were tagged.

The 1987 egg take yielded about 360,000 eggs taken from chinook salmon captured as they migrated through the Whitehorse fishway over the Whitehorse dam. A total of 113 chinook salmon including 71 females and 42 males, was sacrificed for brood stock. At the present time the eggs are still in their critical stage with most eyeing-up without problems. Currently, egg survival is estimated at 90%.

10.0 1988 Run Outlook

10.1 Chinook Salmon

10.1.1 U.S. Stocks

The majority of chinook salmon returning to the Yukon River are 6-year old fish, however, 5 and 7-year old fish make a significant contribution to the run. Minor contributions are also made on occasion by 3,4, and 8-year old fish. The 1982 brood year (6-year olds in 1988) was judged average to below average in abundance in Alaskan streams as judged by comparative escapement information. Survival and production from the 1982 brood year is apparently below average based on preliminary findings of lower than normal contribution of 5-year old fish to the 1987 return. It is expected that the 1988 return of 5-year olds (1983 brood year) will be near average based on 1983 run strength and escapements. The return of 7-year old fish (1981 year class) is expected to be above average as the return of this

year class in 1986 as 5-year olds and in 1987 as 6-year olds was above average. Therefore, the 1988 chinook salmon run is anticipated to be below average in strength.

10.1.2 Canadian Stocks

The total in-river return of Canadian -origin chinook during the past seven years (1980-86) has averaged approximately 117,700 fish (based on Alaskan SPA, Canadian population estimates, and in-river catch data) and the spawning escapement has averaged 31,000 fish. On average the majority of the return is composed of 6-year old fish (64.2%) with significant contribution from 7-year olds (16.9%) and 5-year olds (14.9%). Assuming that the age composition of the 1988 return will be similar to the recent average, major contribution of the 1988 return should originate from the 1982 ecapement. Lesser but significant production should also be provided from the 1981 and 1983 brood years. The total estimated Canadian chinook salmon escapement in these years was as follows:

Year	Estimated Spawning Escapement
1981	41,000 - 51,000
1982	20,000
1983	29,500 - 31,000

The spawning escapement in both 1982 and 1983 was therefore estimated to be below optimum, whereas the 1981 brood year was possibly optimum or better. This suggests that a good return of age 7 chinook salmon should occur in 1988. However an average to below average return of age 5 and age 6 chinook salmon is expected. Combining the escapement and age composition data, and assuming an average production rate of 3 adults/spawner, the projected 1988 total stock is roughly 80,000 fish. This respresents a below average return compared to the recent seven year average.

10.2 Summer Chum Salmon

Yukon River chum salmon return primarily as 4-year old fish, although substantial 5-year old returns often result from good brood survival years. The return of 4-year old fish in 1988 is expected to be above average based on good escapements achieved in 1984. The return of 5-year old fish in 1988 is expected to be below average based on the poor return of 4-year old fish in 1987. In summary, based on evaluation of brood year run size data and assuming average survival, it is expected that the Yukon River summer chum salmon return in 1988 will be average to above average in magnitude.

10.3 Fall Chum Salmon

10.3.1 U.S. Stocks

Similar to the summer run, fall chum salmon return primarily as 4-year old fish. Escapements in 1984 (which will produce 4-year olds in 1988) were below average. The return of 5-year olds (1983 brood year) is expected to be below average based on the number of returning 4-year olds in 1987. In summary, based on evaluation of brood year escapements and assuming average survival, a below average return of fall chum salmon is expected in 1988.

10.3.2 Canadian Stocks

Total Canadian chum escapement estimates (excluding the Porcupine) during the past five years have averaged approximately 67,000. On average, roughly 73% of each year's return is composed of 4-year old fish. Assuming this age composition will hold true for 1988, the primary brood year contributing to the 1988 return will be 1984. Unfortunately no tagging studies were undertaken in 1984 to estimate the total Canadian escapement. However through the extrapolation of the average Canadian harvest rate from the four years where tagging data is available (1982, 83, 85, 86) it is possible to reasonably estimate the 1984 escapement. The average Canadian harvest rate during these years was approximately 28%. The total Canadian catch (excluding Porcupine) in 1984 was 25,300. Assuming that the harvest rate was 28% in 1984, the implied escapement is 65,000, which ia aimilar to the recent five year average but considerably below the interim escapement goal range of 90,000 - 135,000. A point estimate of total expected return of Canadian stocks based on the brood year escapement estimate, average age composition and assumed productivity of 2:1 is 178,000. Although the 1988 return to Canada could therefore be qualitatively projected to be average, it must be emphasized that the recent average value is below optimum. Rebuilding efforts will likely be required again in 1988 in order to improve depressed fall chum stocks in general.

Regarding the Porcupine, the escapement to the Fishing Branch River in 1984 was estimated to be 15,000, which ia the lowest on record dating back to 1974. A below average return is therefore expected for this watershed.

10.4 Coho Salmon

Coho salmon return primarily as 4-year old fish. Comprehensive escapement information for coho salmon is lacking, but escapement surveys in the Tanana River system indicated above average run strength in 1984. The proportion of 3 year old fish in 1987 test fish catch samples further suggests the 1988 return of coho salmon will be above average in magnitude.

11.0 Harvest Strategies

11.1 Stock Specific Harvest Strategies

The JTC examined, in a very general manner, various techniques for targeting effort on specific stocks or stock groups within the Yukon River. These techniques involve consideration of the timing and location of fishing effort. With respect to Yukon River chinook salmon, the JTC examined information on the run timing of lower, middle and upper (Canadian) river stocks based on the ADF&G scale pattern analysis study for the years 1982 through 1986. The timing information suggested some possible ways of reallocating the timing of fishing effort in the lower river that would increase escapement into the middle and upper portions of the river in some years but there was a question on how that would affect the total catch in the lower river. A major problem is that the stock timing differences that may occur some years cannot be identified in-season at the present time. It should be noted again that the intent of the JTC at this time was to examine stock specific harvest strategies in only a very general way in anticipation of eventually having to deal with this subject in a more detailed and formal basis.

12.0 Run Rebuilding

12.1 Rebuilding Depressed Canadian Chinook Salmon Stocks

The JTC made a presentation at the last round of negotiations dealing with the outlook for chinook salmon stocks in the Yukon River under the pre-1986 management regime and under various rebuilding scenarios. This information was explored at the current meeting of the JTC, and is summarized here.

The JTC has recognized in previous reports that spawning escapement of Canadian origin chinook salmon is well below desired levels. The decline in spawning escapement appears to be the result of over-exploitation of these stocks in recent years. Based on ADF&G scale pattern analyses and Canadian estimates of spawning escapement the approximate overall in-river exploitation rate on Canadian origin chinook salmon has been 84%, 78%, 70%, 90%, and 87% for the years 1982 through 1986, respectively.

The model used to examine rebuilding options for Canadian origin chinook salmon is known as MIXNOLOW. Model inputs were as follows:

i)

age class	% returning	brood year escapement
1	0	17,500 (1986)
2	0	10,800 (1985)
3	0	26,836 (1984)
4	0	29,500 (1983)
5	10	20,200 (1982)
6	80	57,325 (1981)
7	10	44,850 (1980)

ii) productivity (rate of return per spawner) = 3.0

iii) interim escapement objective = 38,000
(the midpoint of interim escapement objective range of 33,000-43,000)

iv) relative productivity of surplus spawners = 0.

The model was run using one fishery and one stock.

The first scenario examined was the status quo management regime with an overall exploitation rate on the Canadian stock of 82% (1982-1986 average). The result of this management strategy would be a rapid discontinuous decrease in both total in-river catch and spawning escapement of Canadian origin chinook over the next 20 years (Fig. 1). There would be approximately an order of magnitude reduction in catch from over 100,000 fish in year 1 to 10,000 fish in year 20.

The next scenario examined involved the immediate rebuilding of the chinook salmon stocks to the midpoint of the interim escapement objective range (38,000 fish). In this scenario the first 38,000 (midpoint of the interim escapement objective) fish returning were allocated to spawning escapement and any additional fish to catch (Fig. 2). The result was decreasing catches in years 1 through 5, followed by an increase in catch through year 8, after which catch stabilized at 76,000 fish.

A comparison of the projected catch over the next 20 years from the Canadian origin chinook salmon stock under status quo management (Fig.1) with catch under the immediate rebuilding senario (Fig. 2) is shown in Fig. 3. Over the first six years of the projection, the catch under the rebuilding senario ranged from 14,000 to 29,000 fish less than would be expected from the existing management regime. However, in subsequent years, the rebuilding scenario produced 15,000 to 65,000 more chinook salmon than would have been produced as a result of status quo management. The JTC also examined a rebuilding scenario similar to the one described above, except the rebuilding program was delayed until year six. In the interim the stock was subjected to the recent average exploitation rate of 82%. In this situation the catches at the end of the 20 year projection were similar to those with an immediate rebuilding program. However,

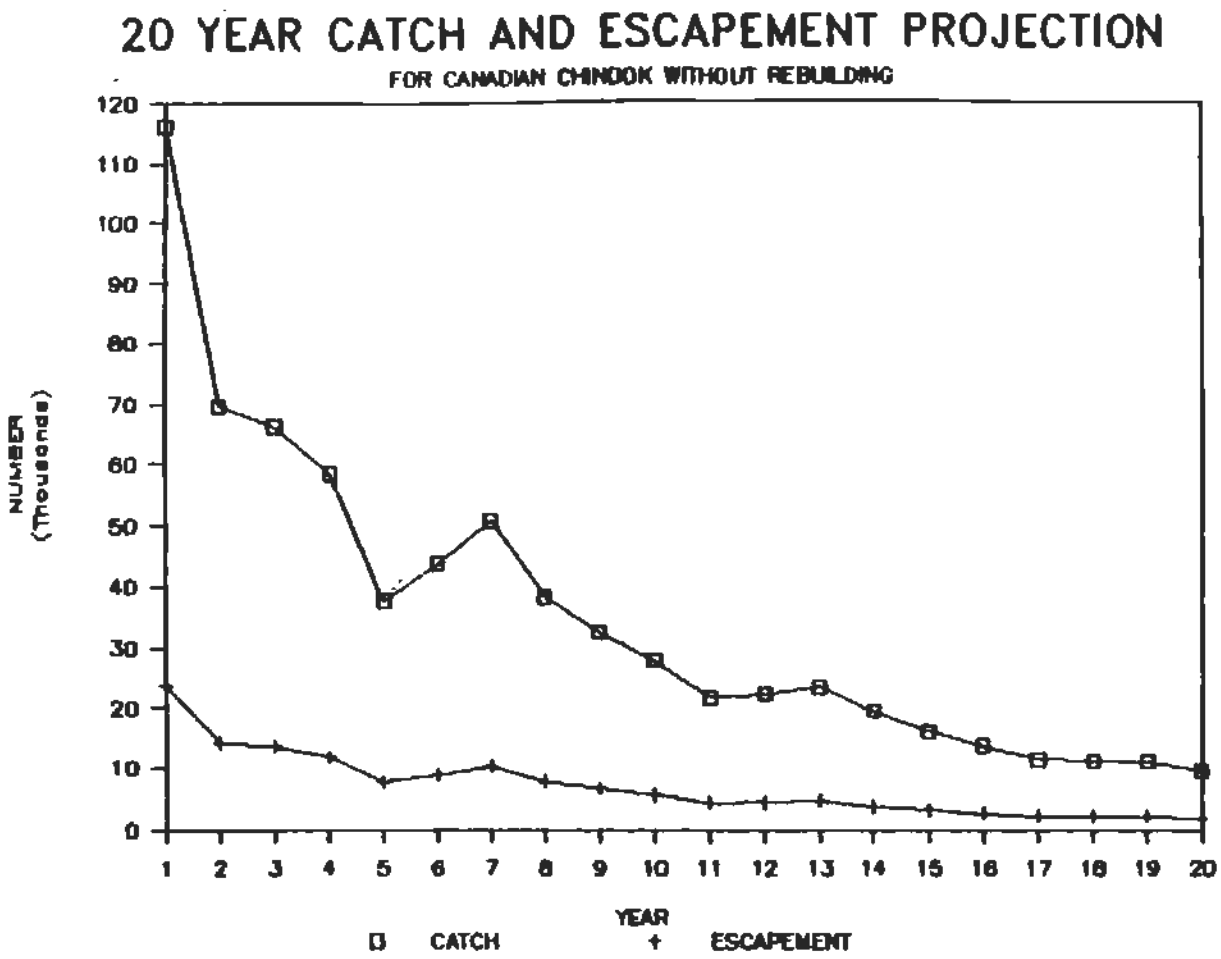

Fig. 1. Twenty year catch and escapement projections for Canadian origin chinook salmon [redacted] without rebuilding(see text for details).

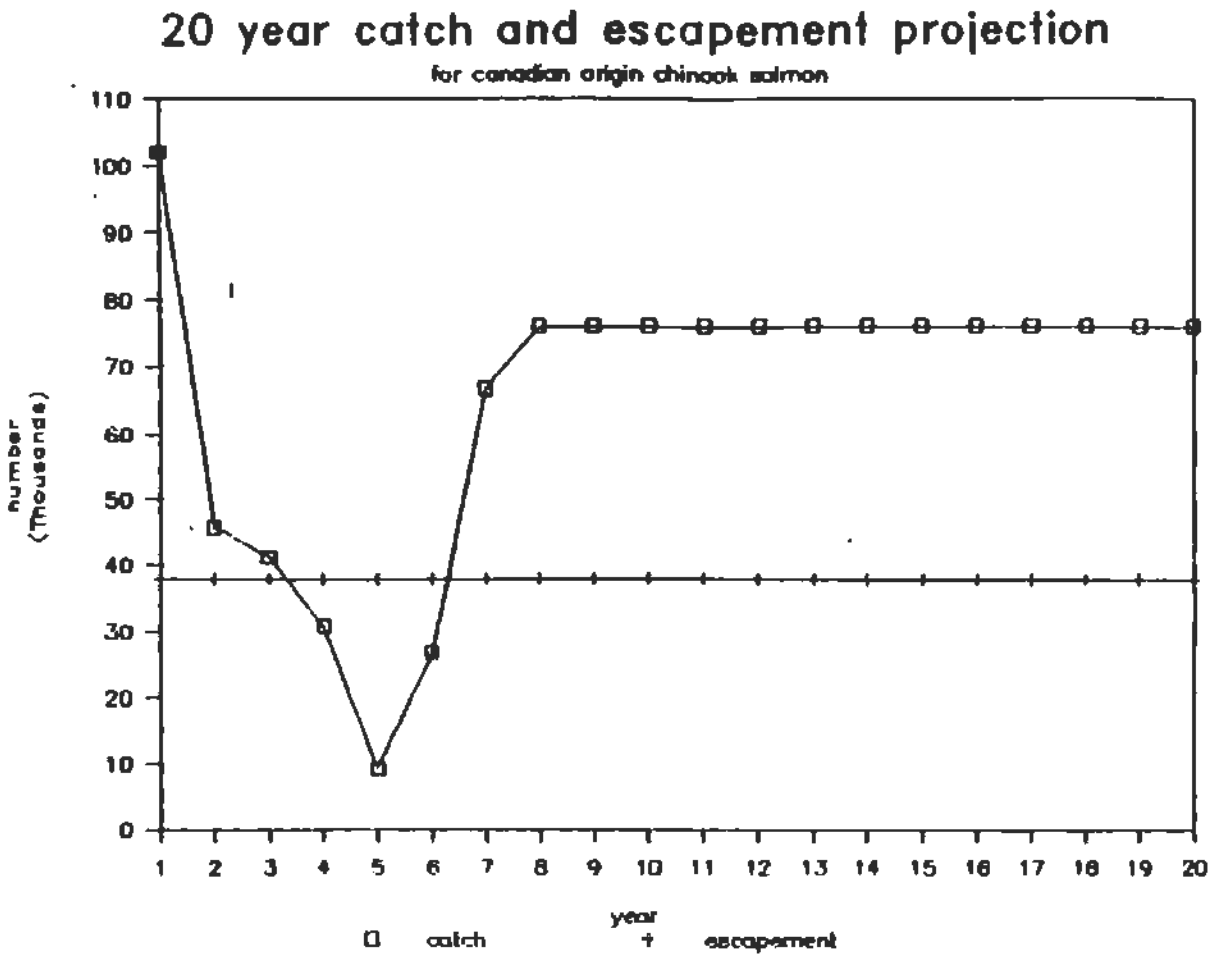

Fig. 2. Twenty year catch and escapement projections for Canadian origin chinook salmon with rebuilding (see text for details).

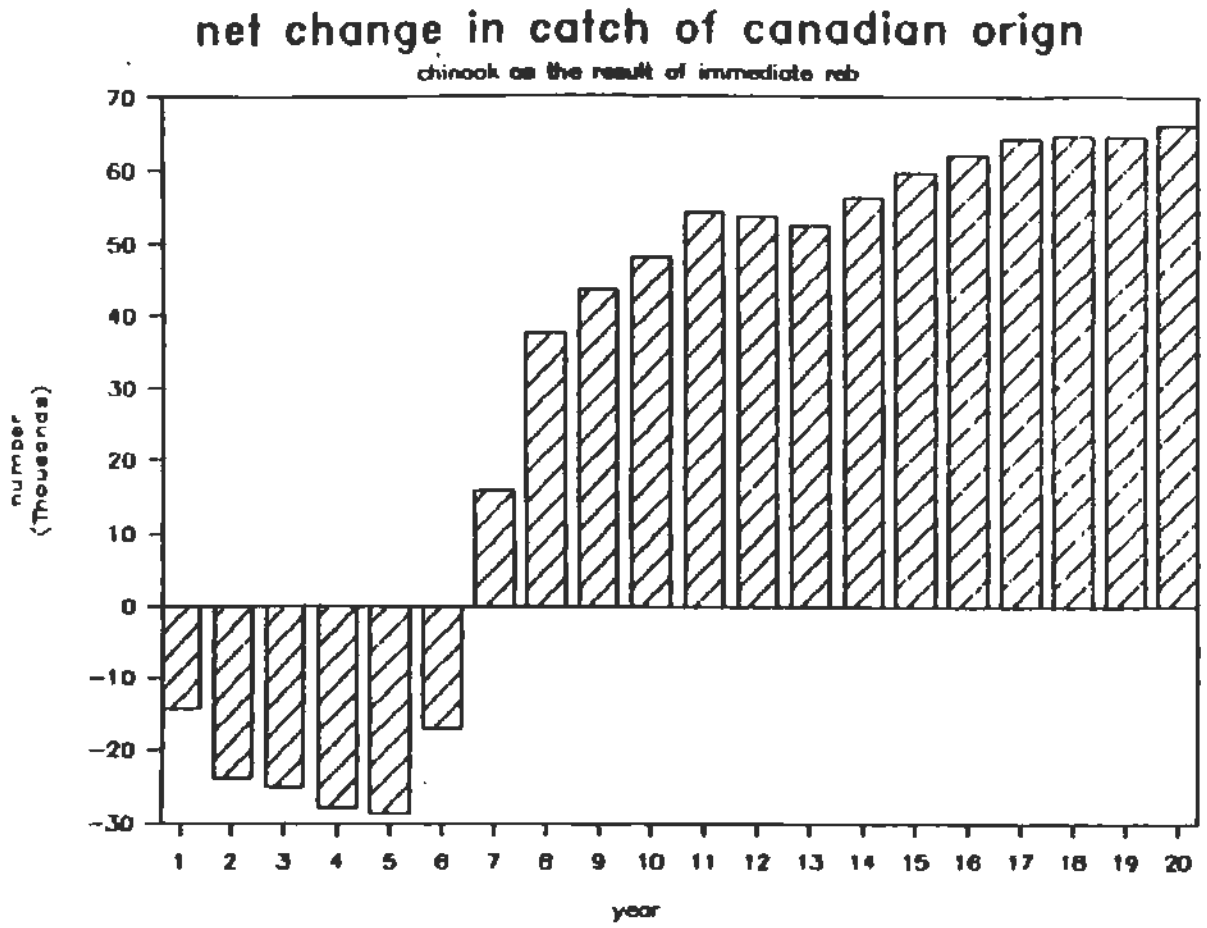

Fig. 3. Net change in the catch of Canadian origin chinook salmon as the result of rebuilding(see text for details).

because of the continued over-exploitation in years one through five the "cost" of rebuilding to the interim escapement objective in years six through eleven was greater than the corresponding cost with the immediate rebuilding program.

12.2 Rebuilding Depressed Fall Chum Salmon Stocks

The JTC made a presentation at the April 1987 negotiations dealing with the outlook for fall chum salmon stocks in the Yukon River under the pre-1986 management regime and under various rebuilding scenarios.

The JTC has recognized in previous reports that spawning escapements of Yukon River fall chum salmon have been below desired levels in recent years, especially during 1982-1984. The decline in spawning escapement appears to be the result of over-exploitation of these stocks in recent years.

The model used to examine rebuilding options for Yukon River fall chum salmon stocks was similar to that developed for chinook salmon. Model inputs were as follows:

i)

Age Class	Percent Returning	Brood Year Escapement Tanana (US)	Porcupine (US)	Mainstem (Canada)	Fishing Branch	(in Year)
1	0	49,552	117,684	87,290	36,462	(1986)
2	0	80,162	274,982	58,510	67,320	(1985)
3	3	57,844	48,834	37,000	18,180	(1984)
4	72	57,024	88,906	88,875	32,640	(1983)
5	25	15,672	56,558	33,780	19,081	(1982)

ii) Productivity (rate of return per spawner) = 2.5

iii) Interim escapement objective (the midpoint of the interim escapement objective range):

Tanana (US) = 88,000
Porcupine (US) = 108,000
Mainstem (Canada) = 112,500
Fishing Branch (Canada) = 75,000

iv) Relative productivity of surplus spawners = 0

The model was run using 4 stocks (Tanana, U.S. Porcupine, Canadian Mainstem and the Fishing Branch), and 5 fisheries. It was necessary to define more than one fishery as each stock is not available for harvest in all parts of the drainage where fisheries are conducted. The fisheries and the stocks available to each fishery were modeled as follows:

Fishery	Stock
1. Alaskan Yukon R. Districts 1-4	All Stocks
2. Alaskan Yukon R. District 6	Tanana
3. Alaskan Yukon R. District 5	Porcupine, Mainstem and Fishing Branch
4. Canadian Porcupine	Fishing Branch
5. Canadian Mainstem	Canadian Mainstem

The first scenario examined was the status quo management regime with exploitation rates on Yukon River fall chum salmon of 36%, 55%, 35%, 4% and 29% respectively for fisheries 1 through 4. The average for the period 1981-1985 was used and these respresent the percent of total return passing through each district (given downriver removals) that was harvested. The result of this management strategy would be a discontinuous decline of both catch and escapement over the next 20 years although not necessarily the escapement of all stocks (Figure 4). There would be a reduction in catch of approximately 113,000 fish or from 462,000, the average for years 1 through 4, to 349,000, the average for years 16 through 20.

The next scenario examined involved the immediate rebuilding of the fall chum salmon stocks to the midpoint of the interim escapement objective ranges for each stock (383,500 fish). In this scenario the first 383,500 fish returning were allocated to spawning escapement and any additional fish to catch (Figure 5). The result was decreasing catches in years 1 and 2, followed by a discontinuous increase in catch through year 6, after which catch stabilizes at around 550,000 fish.

The JTC also examined a rebuilding scenario similar to the one described above, except that rebuilding was delayed until year eight (Figure 6). In the interim the stocks were subjected to status quo exploitation. In this situation the catches at the end of the 20 year projection were similar to those with an immediate rebuilding program. However, because of the continued over-exploitation in years 1 through 8 the "cost" of rebuilding to the interim escapement objective in years 9 through 13 was greater than the corresponding cost with the immediate rebuilding program.

The U.S. began a fall chum salmon rebuilding program in 1986. Using the same model but decreasing the U.S. exploitation rate to reflect the 1986 management plan, catch was projected for 20 years. Figure 7 presents a comparison generated by U.S. members of the JTC between the status quo (1981-1985 exploitation rates) and the U.S. rebuilding program in 1986. It can be seen taht the catch of the rebuilding scenario (1986) exceeds the status quo catch after the sixth year and is sustained at a higher level of some 150,000 fish by the thirteenth year.

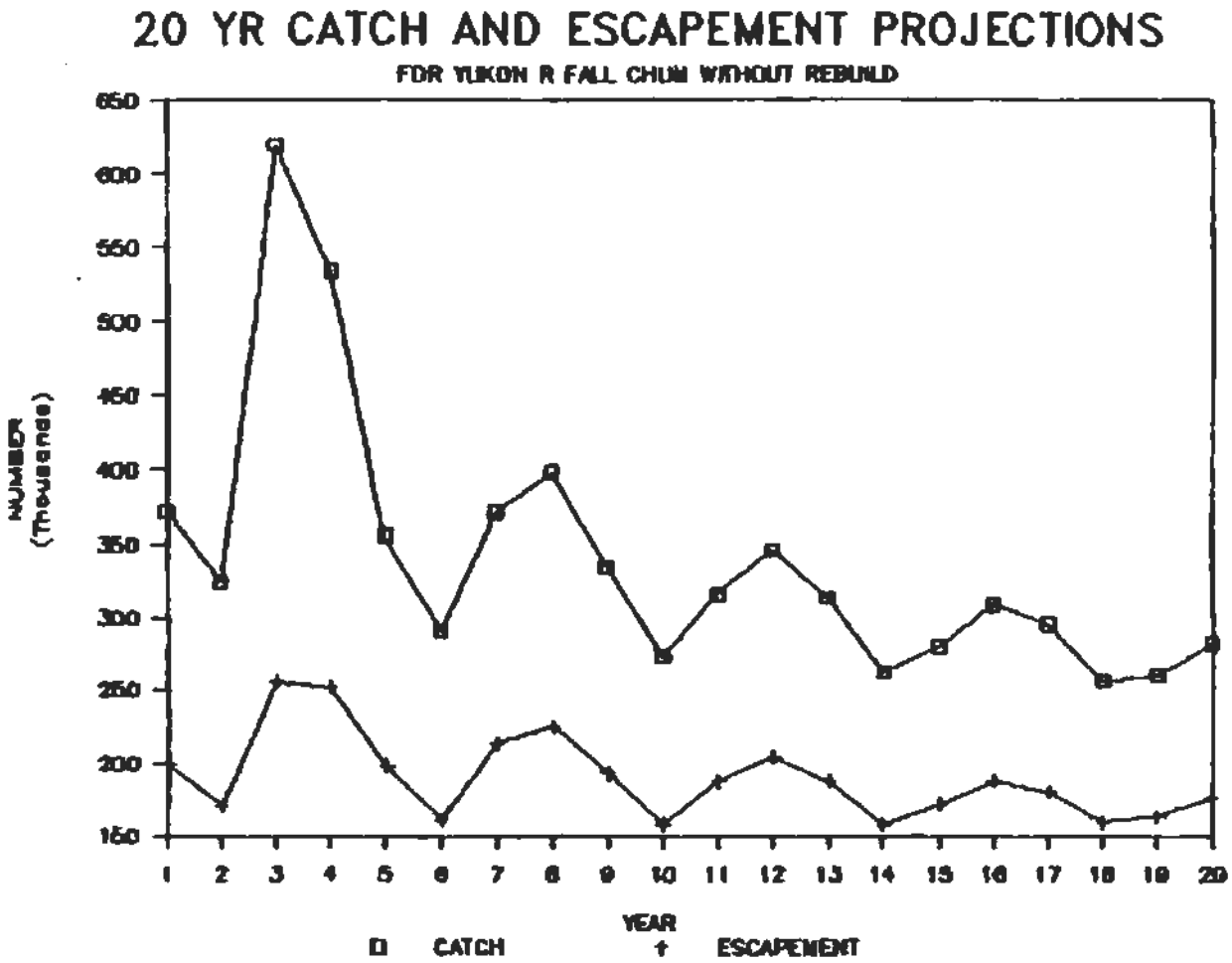

Fig. 4. Twenty year catch and escapement projections for Yukon River fall chum stocks without rebuilding (see text for details).

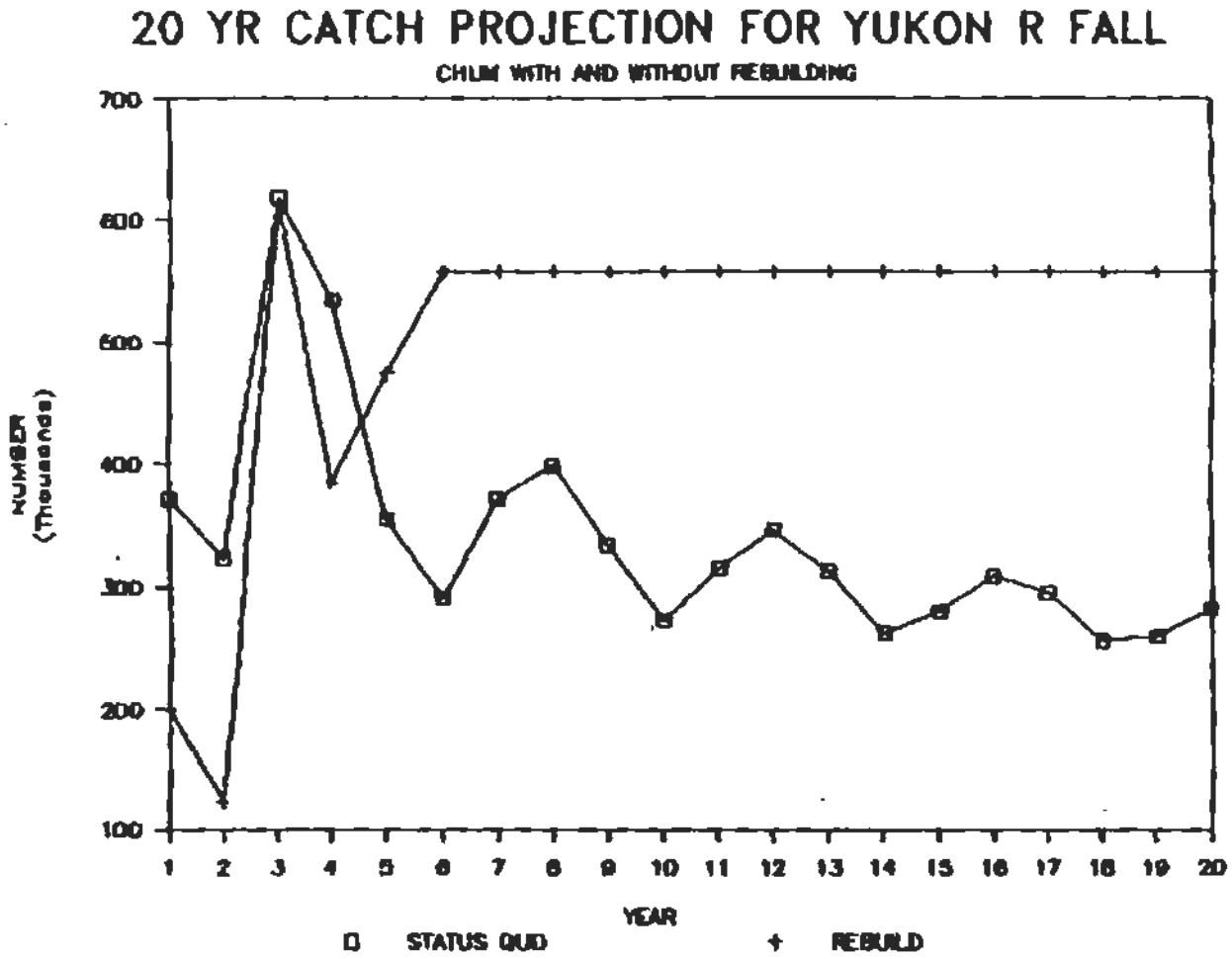

Fig. 5. Comparison of catch projection for Yukon River fall chum stocks with immediate rebuilding and without rebuilding (see text for details).

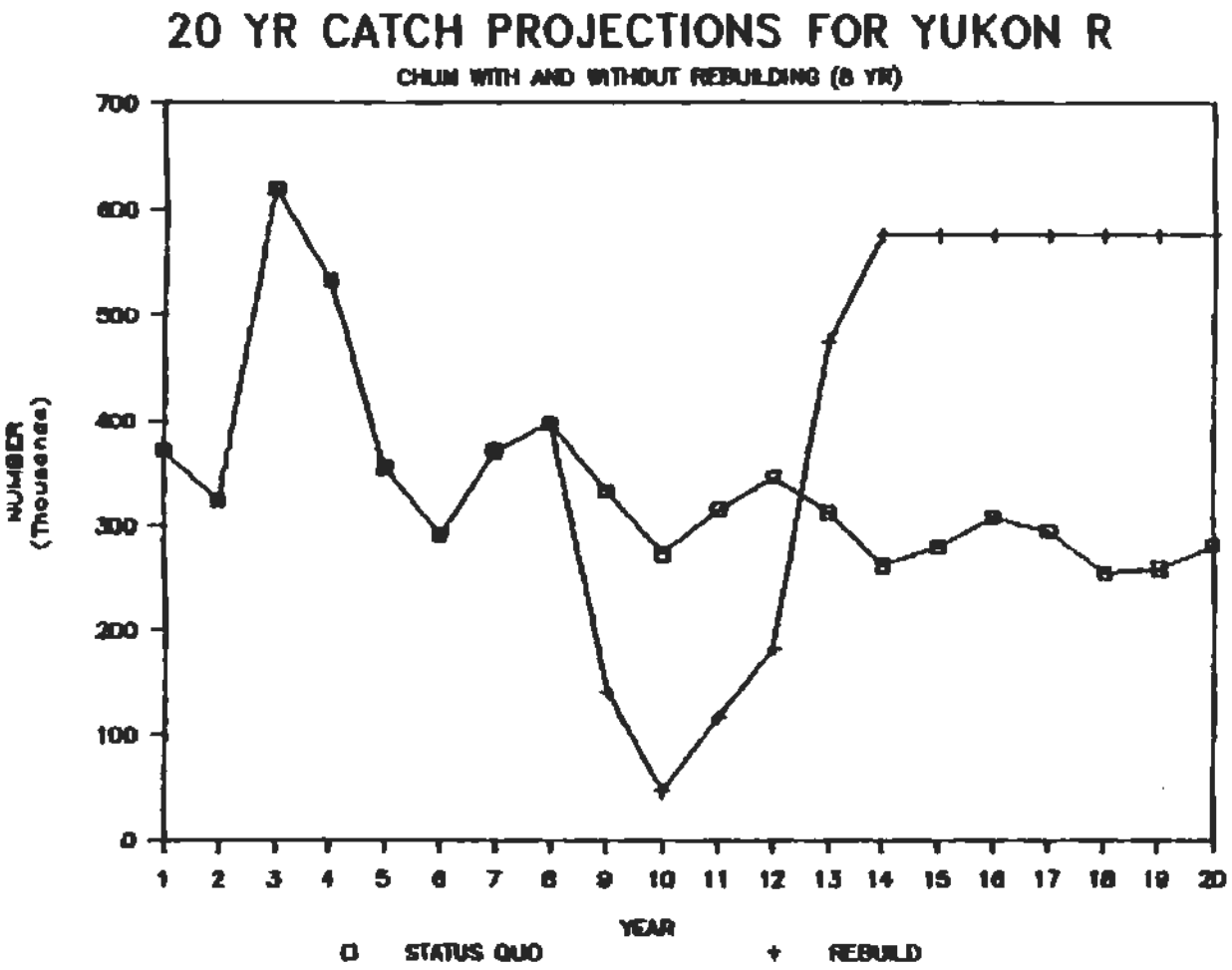

Fig. 6. Comparison of catch projections for Yukon River fall chum stocks with delayed rebuilding and without rebuilding (see text for details).

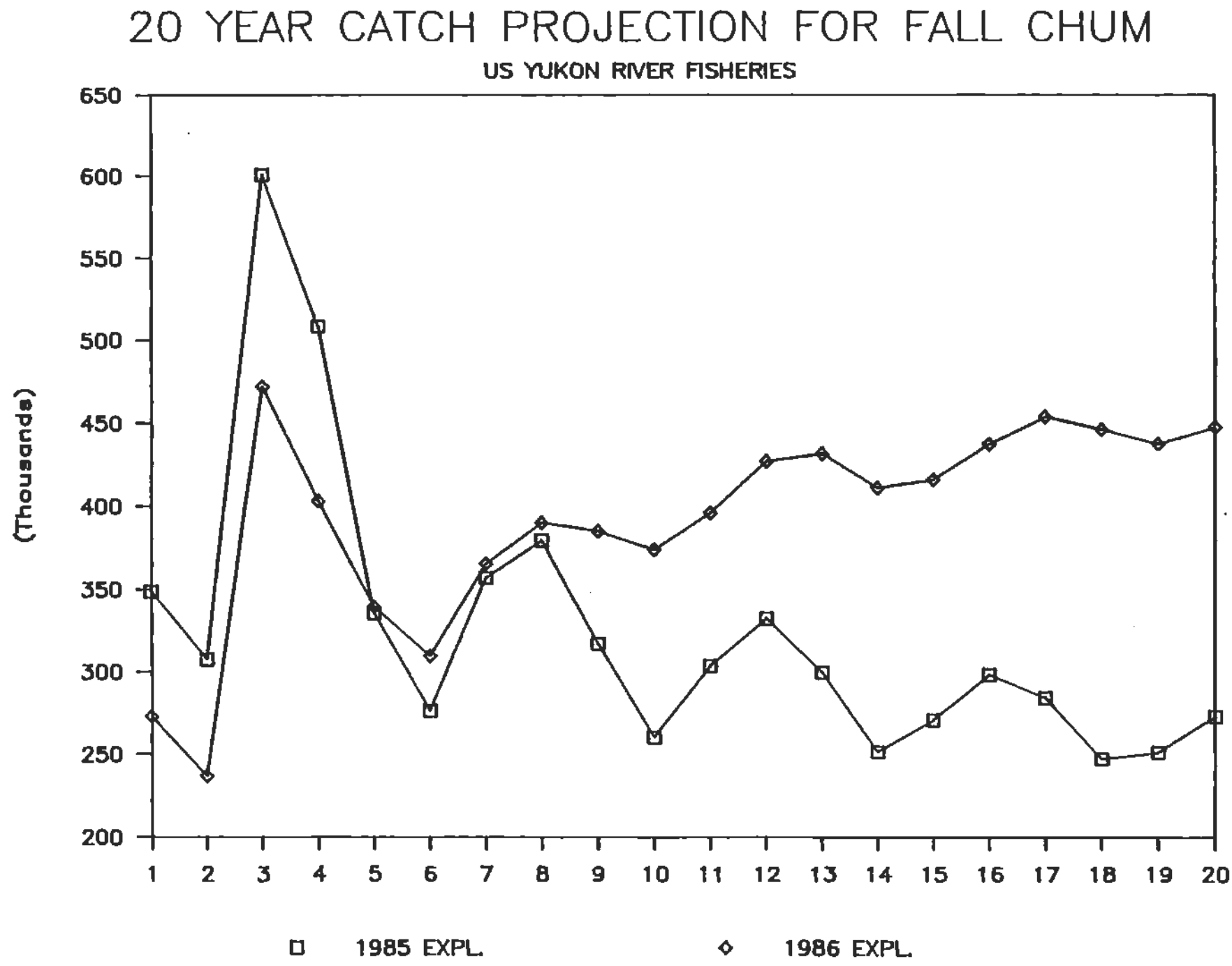

Fig. 7. Comparison of catch projections for Yukon River fall chum stocks using pre- 1986 and

13.0 Data Requests

The U.S. co-chairman of the JTC made a request for the following data and information from Canada:

i) copies of special announcements related to opening and closing of Canadian fisheries (1982-87).

ii) number of commercial fishing licenses authorized and issued from 1980 to 1985 Number of commercial deliveries over the same period.

iii) proportion of total Canadian chinook and fall chum salmon catch going through the Han Fisheries plant;

vi) number of IFF and domestic permits issued annually prior to 1985.

vii) organizational chart for ataff assigned to Yukon River salmon matters in the Whitehorse office.

In addition, in response to an earlier reveiw of the DFO tag-recovery salmon population estimates by ADFG, the JTC agreed to conduct a comprehensive review of this program during its next meeting.

The Canadian co-chair of the JTC made a request for organizational charts for U.S. staff assigned to Yukon River salmon matters in ADF&G, USF&WS and NMFS. A request was also made for salmon catch and effort statistics by date in U.S. Districts 1 and 2. These data were provided at the meeting.